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A COMPUTER PROGRAM FOR OBTAINING AIRPLANE CONFIGURATION PLOTS FROM DIGITAL DATCOM INPUT DATA

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A COMPUTER PROGRAM FOR OBTAINING AIRPLANE CONFIGURATION PLOTS FROM DIGITAL DATCOM INPUT DATA

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ABSTRACT

A computer program is described which reads the input file for the USAF Stability and Control Digital Datcom program and generates plots from the aircraft configuration data. These plots can be used to verify the geometric input data to the Digital Datcom program. The program described interfaces with utilities available at Langley Research Center for plotting aircraft configurations by creating a file from the Digital Datcom input data.

INTRODUCTION

The USAF Digital Datcom (Refs. 1 and 2) is a Fortran program implementation of the USAF Stability and Control Datcom (Ref. 3). Digital Datcom is useful for analyzing configurations in a wide range of flight conditions and can be used to find static and dynamic stability derivatives, as well as trim conditions and control power coefficients. The output data closely resembles reduced data from wind tunnel tests. Hence, Digital Datcom is valuable either for confirming experimental results or for estimating initial quantities for preliminary design.

This report describes a computer program, herein referred to as DATPLOT, which plots Digital Datcom input data as an airplane configuration. This provides a means of checking for data coding or keypunch errors, allowing the engineer to have greater confidence in using Digital Datcom.

Although a program, D2290, exists at Langley Research Center for plotting aircraft configurations in both batch and interactive modes (Ref. 4), the required input for this program is substantially different than that used for Digital Datcom. DATPLOT is a preprocessor which reads the pertinent data cards from a Digital Datcom input deck, finds and calculates the values needed by D2290, and prepares a file in the proper format for use by D2290. The procedure file for terminal or batch operation of DATPLOT is called PDTPLT. Table 1 is a compilation of pertinent files and their respective functions and Table 2 demonstrates the needed commands to execute PDTPLT in batch or interactive modes.

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PROGRAM DESCRIPTION

Datcom Background

USAF Stability and Control Digital Datcom is a Fortran program available to LaRC users for computing static and dynamic stability derivatives as well as high lift and control power coefficients. The input to Digital Datcom consists of case control cards and up to 22 namelists.

The title of the plots is taken from the CASEID control card. All other information is obtained from reading 9 of the available 22 Digital Datcom namelists. These nine namelists are as follows:

OPTINS	Defines the flight conditions
SYNTHS	Reference parameters
BODY	Body geometric data
WGPLNF	Wing planform variables
HTPLNF	Horizontal tail planform variables
VTPLNF	Vertical tail planform variables
VFPLNF	Vertical fin planform variables
JETPWR	Jet power parameters
PROPWR	Propeller power parameters

Namelists and case control cards may appear in any order in the input to Digital Datcom. This input file should be named TAPE4 when using the procedure file PDTPLT to execute the program DATPLOT (see Table 1 for file definitions). Since the nine namelists mentioned above and the CASEID card are needed by DATPLOT, the procedure file PDTPLT adds empty namelists and a CASEID card to TAPE4 prior to execution of DATPLOT. This prevents DATPLOT from failing even if the user does not specify one of the required namelists while building his or her Digital Datcom model (TAPE4). Sample input files to Digital Datcom (TAPE4) for four airplane configurations are tabulated in Appendix I. Plots generated from these data files are shown in Figures 2 through 7.

Program Logic and Organization

Flow charts for procedure file PDTPLT and program DATPLOT are shown as figures 8 and 9, respectively. A listing of program DATPLOT is included as Appendix II. As indicated in figure 8, DATPLOT reads TAPE4, an input file intended for Digital Datcom, and writes TAPE7, an input file for D2290, the airplane graphics program available at Langley Research Center. Appendix III is a tabulation of the four TAPE7 files generated when DATPLOT processed the Digital Datcom input files from Appendix I. The plots of these four airplane configurations are shown as figures 1 through 4.

The first line of TAPE7 is the plot title, which DATPLOT reads from the CASEID of the Digital Datcom input file. The second line of TAPE7, which is generated by DATPLOT, consists of the 24 control integers that are required by D2290. The first seven control integers indicate which parts of the aircraft configuration are to be plotted: wings, fuselage, pods, fins and canards. The other control integers indicate the number of wing sections to be described, the number of fuselage sections, the number of pods, fins, etc.

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DATPLOT reads namelist OPTINS, SYNTHS and BODY on the Digital Datcom input file to determine whether the data necessary for plotting each configuration are present, and sets the 24 control integers accordingly. These values of control integers constitute the defaults for the aircraft configuration plots. The user has the option of not using the defaults and may look at less of the aircraft configuration, if it is so desired. This is especially useful when trying to eliminate errors in the Digital Datcom input deck. In this case of plotting partial configurations, DATPLOT calls subroutine OPTIONS and resets the first seven control integers.

DATPLOT checks against the first seven control integers to determine what is to be plotted. DATPLOT then calls a series of subroutines to read each namelist containing geometry information for each configuration part to be plotted. Coordinates and dimensions are computed and scaled prior to output to TAPE7 in accordance with D2290 requirements.

DATPLOT sets the wing control integers for three uncambered airfoil sections along the wing semi-span: (1) the root chord section; (2) the tip chord section; and (3) the breakpoint section. Each wing airfoil section is assumed to be symmetrical about its chord and is described by 10 points along its upper periphery. In the absence of an outboard wing section, a zero length wing tip section is written to TAPE7 in order to remain consistent with the control integer settings.

The fuselage can be represented two ways: as a cambered fuselage or as a circular fuselage. If the Z-coordinate of the upper and lower points of the fuselage are given at each station, a cambered fuselage is assumed. In this case, 20 points along the positive Y portion of the Y-Z cross section are computed as input for TAPE7. Otherwise, the value of the area of each cross section is written to TAPE7.

Digital Datcom input provides for up to two engines. DATPLOT reads namelist JETPWR to determine the presence of jet engines. If no jets are described, DATPLOT reads namelist PROPWR. If the number of propeller engines described is also zero, data for a pod of zero length and zero diameter will be written on TAPE7 (See Figs. 4a and 4b).

In the case of engine data, DATPLOT calculates the location of the engines, estimates the dimensions and writes the information on TAPE7 as pod data for D2290. Only one engine is described since D2290 assumes all aircraft configurations to be symmetrical about the X-Z plane.

The vertical tail is read from namelist VTPLNF and is written as fin data for D2290 on TAPE7. If the vertical tail has a dorsal fin, the data is contained in namelist SYNTHS. XVF is assumed to be the X-coordinate of the leading edge of the triangular dorsal fin where it meets the fuselage. ZVF is assumed to be the vertical position along the leading edge of the vertical tail where the dorsal fin joins it. DATPLOT calculates the coordinates and dimensions as a fin that approximates the shape of a vertical tail with a dorsal fin protruding forwards.

If the horizontal tail or canard has outboard vertical fins (see Figs. 3a and 3b), DATPLOT assumes that they are given in Digital Datcom as the outboard sections of the horizontal tail surface with a dihedral angle approaching 90°. The dimensions and coordinates of outboard vertical panels and horizontal tail planes are computed from the data in namelist HTPLNF. The horizontal tail is plotted as a canard by D2290.

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After all of the appropriate namelists are read and the aircraft configuration data has been written on TAPE7 in a format useable by D2290, plotting instructions are required. The view and rotations are selected by subroutine PLTCARD. PLTCARD writes the lines on TAPE7 needed for two default views or allows the user to specify alternatives. The two default views chosen by DATPLOT are an orthogonal projection of the configuration and a three-in-one view of the aircraft.

PROGRAM USE AND OPERATION

The procedure file PDTPLT is used to operate DATPLOT and consists of three records. The first two records are used for batch jobs and the third record is used for interactive jobs. A listing of PDTPLT is shown as Appendix IV and a block diagram showing the relationship of PDTPLT, DATPLOT, Digital Datcom and D2290 is shown in figure 8.

Batch Operations

The first record on the procedure file PDTPLT contains a submit file. The user needs to complete the file with the appropriate delivery information, account number, charge number, the name of the Digital Datcom input file (GET,TAPE4=filename.) and the kind of plotting device desired (PLOT.device). Table 2(b) shows the commands needed to operate PDTPLT in batch mode.

The second record is the user input to the submit file and indicates the plotting options. A YES or a NO must appear on the first line and answer the question: Do you want to accept plotting default values? If the answer is YES, no other lines of input are needed and none are read. If NO appears on the first line, another YES or NO must appear on the second line. It answers the question: Do you want to plot the entire configuration?

If the answer is NO, two more lines are needed prior to continuing. The first card is the plot title and the second card includes the 24 plot control integers in fields of three columns as required by D2290. See reference 4 for details.

If the first line of this input data record is NO, then viewing instructions need to be given. They will start on line three if the second line is YES and line five if the second line is NO. There are four viewing choices as specified by D2290:

ORT	Orthographic views
VU3	Three-in-one views
PER	Perspective views
STE	Stereographic views

Viewnames and view instructions are listed until no more plots are desired. This is indicated by a value of one (1) for KODE on the instruction line. Refer to reference 4 for complete plotting instructions.

To submit PDTPLT for batch operation, type: SUBMIT,PDTPLT,B. To send PDTPLT, type: SEND,PDTPLT,M = machine code.

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Interactive Operations

DATPLOT is best suited for use on a Tektronix graphics terminal. The third record on file PDTPLT contains procedure PLOT. The user needs to name his Digital Datcom input file as TAPE4 (i.e., GET,TAPE4=filename) and type BEGIN,PLOT,PDTPLT. Configuration and plotting view options are answered by typing a "Y" or "N". A sample session using the first and fourth input file of Appendix I is shown as Appendix V and the plots that were obtained are shown as figures 5 through 7. Generally, the user need only answer a series of questions and then plots will be generated at the screen.

CONCLUDING REMARKS

A Fortran computer program (DATPLOT) and a procedure file (PDTPLT) have been described which interface the USAF Stability and Control Digital Datcom with D2290, a Langley Research Center utility for plotting aircraft configurations. DATPLOT allows the input data to Digital Datcom to be plotted providing an opportunity for Digital Datcom users to validate models undergoing analysis. Although the DATPLOT is intended primarily as an interactive tool, its use for batch operations is also presented.

REFERENCES

1. Williams, J. E.; and Vukelich, S. R.: The USAF Stability and Control Digital Datcom. AFFDL-TR-76-45, Vols. 1 and 2, November 1976.

2. Williams, J. E.; and Vukelich, S. R.: The USAF Stability and Control Digital Datcom. AFFDL-TR-79-3632, Vols. 1 and 2, April 1979.

3. Hoak, D. E.: USAF Stability and Control Datcom. AFFDL, Wright-Patterson AFB, OH, April 1976.

4. Craidon, Charlotte B.: Description of a Digital Computer Program for Airplane Configuration Plots. NASA TM X-2074, September 1970.

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Table 1 - List of Files Needed to Plot Aircraft Configurations

Name	Description
Digital Datcom	USAF computer program for analyzing stability and control derivatives of aircraft configurations.
TAPE4	Input data intended for Digital Datcom.
PDTPLT	Procedure file which uses DATPLOT to interface Digital Datcom with D2290.
DATPLOT	Program which reads TAPE4 and writes TAPE7 for D2290.
TAPE7	Input data to be processed by D2290.
D2290	Aircraft plotting utility available at Langley Research Center.

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Table 2 - Statements Required to Execute PDTPLT.

Interactive use:

```
GET,PDTPLT/UN=760679C.
GET,TAPE4=filename of Datcom input data.
BEGIN,PLOT,PDTPLT.
```

Batch use:

```
GET,PDTPLT/UN=760679C.

Edit PDTPLT to give:  1) User name and password
                      2) Delivery information
                      3) Name of Datcom input data file

SEND,PDTPLT,M=machine code.
```

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APPENDIX I - Sample Digital Datcom Input Decks.

Datcom Input for the Navion Airplane. (see figures 1a and 1b)

```
CASEID NAVION WITH ELEVATORS AND NO FLAPS OR AILERON DEFLECTIONS
 $FLTCON NMACH=1.0,MACH(1)=0.158,NALPHA=9.0,ALSCHD(1)=-2.0,0.0,1.0,
  2.0,4.0,8.0,12.0,16.0,20.0,RNNUB(1)=1.07E6,
  PINF(1)=1967.62,NALT=1.0,ALT(1)=2000.0,
  VINF=176.0,TINF(1)=511.57,GAMMA=0.0,WT=2750.0$
 $OPTINS SREF=184.0,CBARR=5.7,BLREF=33.4$
 $SYNTHS XCG=8.03,ZCG=-0.47,XW=5.80,ZW=-2.12,ALIW=0.0,XH=21.64,
  ZV=0.0,XVF=19.76,ZVF=1.25,
  ZH=0.78,ALIH=0.0,XV=23.21,VERTUP=.TRUE.$
 $BODY NX=18.0,ITYPE=1.0,
  ZU(1)=1.019,1.372,1.490,1.764,2.038,2.078,2.509,2.979,3.136,3.215,
   3.136,2.900,2.470,1.686,1.450,1.215,0.862,0.548,
  ZL(1)=-1.019,-1.372,-1.490,-1.764,-2.038,-2.117,-2.156,-2.195,
   -2.195,-2.195,-2.195,-2.156,-2.117,-1.960,-1.568,-1.176,-0.862,
   -0.392,
  X(1)=0.0,0.314,0.666,2.352,4.077,5.449,6.115,6.939,7.644,8.311,
   9.840,11.055,12.505,14.191,17.327,20.503,23.639,27.755,
  S(1)=3.765,6.422,7.433,9.992,12.799,13.815,15.802,17.685,
   18.552,18.823,18.384,17.130,14.969,10.887,6.881,3.904,2.163,0.125,
  P(1)=6.913,8.999,9.668,11.207,12.683,13.176,14.114,15.019,15.399,
   15.533,15.[illegible]3,14.765,13.749,11.702,9.299,7.039,5.618,2.292,
  R(1)=1.176,1.490,1.568,1.803,1.999,2.097,2.156,2.176,2.215,2.215,
   2.195,2.156,2.078,1.901,1.470,1.039,0.627,0.078$
NACA-W-6-643-618
NACA-H-6-631-012
 $WGPLNF CHRDTP=3.73,SSPNE=14.43,SSPN=16.70,CHRDR=7.29,SAVSI=1.0,CHSTAT=0.25,
  TWISTA=0.0,DHDADI=8.5,DHDADO=0.0,TYPE=1.0$
 $JETPWR  $
 $PROPWR $
 $VTPLNF CHRDTP=1.88,SSPNE=4.39,SSPN=5.02,CHRDR=4.47,SAVSI=13.5,
  CHSTAT=.25,TYPE=1.0$
 $HTPLNF CHRDTP=2.51,SSPNE=6.19,SSPN=6.59,CHRDR=[illegible].02,SAVSI=6.0,CHSTAT=0.25,
  TWISTA=0.0,DHDADI=0.0,DHDADO=0.0,TYPE=1.0$
 $SYMFLP FTYPE=1.0,NDELTA=9.0,DELTA(1)=-40.,-30.,-20.,-10.,0.,10.,20.,30.,
  40.,SPANFI=.400,SPANFO=6.586,CHRDFI=1.882,CHRDFO=.706,NTYPE=1.0,
  CB=.357,TC=.220,PHETE=.003,PHETEP=.002$
TRIM
DAMP
PART
DERIV RAD
NAMELIST
SAVE
NEXT CASE
```

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Datcom Input for the Boeing 737 Aircraft. (see figures 2a and 2b)

```
CASEID  BOEING 737
 $FLTCON WT=115000.,NMACH=1.,MACH(1)=.194,NALT=2.,ALT(1)=1500.,2000.,
         PINF=1967.62,VINF=215.68,TINF=511.57,
         NALPHA=5.,ALSCHD(1)=-2.,0.,1.,2.,4.,GAMMA=0.,RNNUB(1)=1.07E6$
 $OPTINS BLREF=93.0,SREF=1329.9,CBARR=14.3$
 $SYNTHS XW=28.3,ZW=-1.4,ALIW=1.0,XCG=41.3,ZCG=0.0,
  XH=76.6,ZH=6.2,
  XV=71.1,ZV=7.6,
  XVF=66.2,ZVF=13.1,
  VERTUP=.TRUE.$
 $BODY NX=14.,
       BNOSE=2.,BTAIL=2.,BLA=20.0,
  X(1)=0.,1.38,4.83,6.90,8.97,13.8,27.6,55.2,
        65.6,69.0,75.9,82.8,89.7,90.4,
  ZU(1)=.69,2.07,3.45,4.38,5.87,5.90,8.28,
        8.28,8.28,8.28,7.94,7.59,7.50,6.9,
  ZL(1)=-.35,-1.73,-3.45,-3.80,-4.14,-4.49,-4.83,
        -4.83,-3.45,-2.76,-0.81,1.04,4.14,6.21,
  R(1)=.34,1.38,2.76,3.45,4.14,5.18,6.21,6.21,
        5.87,5.52,4.14,2.76,.69,0.0,
  S(1)=.55,8.23,28.89,44.31,65.06,92.63,127.81,
       127.81,108.11,95.68,56.88,28.39,3.64,0.11$
 $WGPLNF CHRDR=23.8,CHRDTP=4.8,CHRDBP=12.4,
       SSPN=46.9,SSPNOP=31.1,SSPNE=40.0,CHSTAT=.25,TWISTA=0.,TYPE=1.,
       SAVSI=29.,SAVSO=26.0,DHDADI=0.,DHDADO=4.$
 $JETPWR NENGSJ=2,JEVLOC=-5.2,JIALOC=34.5,JELLOC=15.9,JEALOC=58.0,
         JINLTA=13.4,AIETLJ=-5.    $
 $VTPLNF CHRDR=15.9,CHRDTP=4.8,SAVSI=33.,
         SSPN=27.6,SSPNOP=0.,SSPNE=20.7,CHSTAT=.25,TWISTA=0.,TYPE=1.$
 $HTPLNF CHRDR=12.4,CHRDTP=4.1,
       SSPN=17.6,SSPNE=15.87,CHSTAT=.25,TWISTA=0.,TYPE=1.,
         SAVSI=31.,DHDADI=9.$
 $SYMFLP FTYPE=1.,NDELTA=9.,DELTA(1)=-40.,-30.,-20.,-10.,
         0.,10.,20.,30.,40.,SPANFI=0.,SPANFO=14.,CHRDFI=1.72,
         CHRDFO=1.72,NTYPE=1.,CB=.50,TC=.44,PHETE=.003,PHETEP=.002$
NACA-W-4-0012-25
NACA-H-4-0012-25
BUILD
NAMELIST
DAMP
PART
DERIV RAD
TRIM
NEXT CASE
```

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Datcom Input for the Mohawk Propellor Airplane. (see figures 3a and 3b)

```
CASEID MOHAWK - 2 PROPELLERS, TAIL WITH VERTICAL SECTIONS
 $OPTINS SREF=330. $
 $SYNTHS XW=10.9,ZW=-1.3,XH=33.2,ZH=1.7,XV=35.3,ZV=1.3,XVF=29.8,ZVF=2.7$
 $BODY NX=20.,
       X(1)=0.,.42,.85,1.70,2.55,3.40,4.25,5.10,5.95,6.80,7.65,8.50,
            9.35,10.2,12.75,25.5,29.75,34.0,39.95,40.8,
       R(1)=.200,1.20,1.683,2.32,2.63,2.69,3.13,3.30,3.30,3.10,2.90,
            2.56,2.34,2.32,2.22,1.72,1.48,1.11,.37,.14,
       ZU(1)=-2.15,-1.35,-.74,-.13,.87,1.75,1.95,2.09,2.11,2.09,2.02,
            1.82,1.55,1.41,1.41,1.41,1.35,1.28,1.28,.94,
       ZL(1)=-2.62,-3.1,-3.37,-3.70,-3.97,-4.11,-4.24,-4.31,-4.31,-4.31,
           -4.24,-4.24,-4.14,-4.11,-3.9,-2.56,-1.95,-1.28,.13,
            .74$
 $WGPLNF CHRDR=11.1,CHRDTP=5.5,CHRDBP=0.,
         SSPN=21.0,SAVSI=2.3,DHDADI=6.5    $
 $JETPWR   $
 $PROPWR AIETLP=0.,NENGSP=2.,PHALOC=8.5,PHVLOC=1.3,
         YP=9.0,PRPRAD=4.3   $
 $VTPLNF CHRDR=5.4,CHRDTP=3.0,SSPN=7.1,SAVSI=7.0  $
 $HTPLNF CHRDR=7.7,CHRDBP=3.8,CHRDTP=1.7,SSPN=6.8,
         DHDADI=8.0,DHDADO=95.,SSPNOP=5.1,SAVSI=14.0,SAVSO=9.$
```

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Datcom Input for the ASW-20 Sailplane.(see figures 4a and 4b)

```
CASEID ASW-20 SAILPLANE
 $FLTCON NMACH=1.,MACH=.1,VINF=100.,TINF(1)=511.57,RNNUB(1)=.624E6,
        NALPHA=5.,ALSCHD(1)=-2.,0.,1.,2.,4.,NALT=1.,ALT(1)=1000.,
        WT=926.,GAMMA=0.,PINF=1967.6$
 $OPTINS BLREF=24.60,SREF=113.0,CBARR=2.554$
 $SYNTHS XW=7.236,ZW=.958,XH=21.494,ZH=4.256,XCG=9.045,ZCG=.532,
  ZV=0.0,XV=20.324,ALIW=0.,ALIH=0.$
 $BODY NX=20.0,ITYPE=1.0,BNOSE=2.,BTAIL=2.,
  X(1)=0.,0.638,1.383,2.075,2.788,3.458,4.150,4.895,5.533,6.278,6.917,
       7.661,8.406,9.790,11.173,11.918,12.556,13.993,14.684,22.400,
  R(1)=0.053,.292,.532,.718,.824,.931,1.010,1.064,1.090,1.090,1.064,
       .984,.904,.771,.665,.631,.596,.562,.528,.186,
  ZU(1)=.085,.479,.798,1.100,1.330,1.543,1.702,1.808,1.883,1.926,
        1.883,1.862,1.755,1.543,1.321,1.219,1.102,.957,.883,.160,
  ZL(1)=-.021,-.319,-.532,-.691,-.809,-.904,-.957,-1.01,-1.01,-.957,
        -.872,-.745,-.638,-.479,-.340,-.287,-.234,-.160,-.16,-.212,
  S(1)=.009,.375,1.125,2.045,2.816,3.646 4.299,4.803,5.053,5.033,
       4.682,4.11,3.465,2.494,1.757,1.504,1.255,.986,.865,.109$
 $WGPLNF CHRDR=2.897,CHRDTP=1.249,CHRDBP=2.247,SSPN=24.67,SSPNOP=9.089,
      DHDADI=3.,DHDADO=3.,CHSTAT=.25,TWISTA=0.,SSPNDD=9.089,TYPE=1.,
      SSPNE=23.67,SAVSI=0.,SAVSO=0.$
 $SYMFLP FTYPE=1.0,NDELTA=9.0,DELTA(1)=-40.,-30.,-20.,-10.,0.,10.,20.,30.,
  40.,SPANFI=.0,SPANFO=9.089,CHRDFI=.532,CHRDFO=.372,NTYPE=1.0,
  CP=.452,TC=.20,PHETE=.003,PHETEP=.002$
 $VTPLNF CHRDR=3.322,CHRDTP=2.039,SAVSI=14.,SSPN=4.243,SSPNOP=0.,
      SSPNE=4.1,CHRDBP=0.,SAVSO=0.,CHSTAT=.25,TYPE=1.,SVWB=18.,
      SVB=9.,SVHB=1.$
 $HTPLNF CHRDR=1.809,CHRDTP=1.171,SSPN=3.618,SAVSI=4.,
         SSPNE=3.400,CHSTAT=.25,TWISTA=0.,
         DHDADI=0.,TYPE=1.,DHDADO=0.$
NACA-W-6-643-212
NACA-H-6-631-012
NACA-V-6-631-012
NAMELIST
BUILD
DAMP
PART
DERIV RAD
TRIM
```

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APPENDIX II - Program Listing

```
      PROGRAM DATPLOT(INPUT,OUTPUT,TAPE4,TAPE7)
C
C *****************************************************************************
C *   DATPLOT  -  A PROCEDURE FOR PLOTTING DATCOM AIRCRAFT CONFIGURATIONS    *
C *****************************************************************************
C
C
C  PROGRAM DATPLTS ASSUMES THAT ALL VARIABLES AND ARRAYS ARE INITIALIZED TO ZERO
C  THIS IS ACCOMPLISHED THROUGH PRESET=ZERO, AT LOADING TIME.
C
C
      COMMON/WG/NWAF,NWAFOR,XW,ZW,ALIW
      COMMON/FUSL/NRADX,NFORX,NX,ZU,ZL,R,X,S
      COMMON/FIN/XV,ZV,NF
      COMMON/F2/XVF,ZVF
      COMMON/CANARD/XH,ZH,ALIH
      COMMON/JAYS/J0,J1,J2,J3,J4,J5,J6
      COMMON/NS/NP,NFCDOR,NCAN,TNAME
      COMMON/RUNS/RUNTYPE,DEFLT
      COMMON/JET/NENGSJ,JIALOC,JELLOC,JEVLOC,JEALOC,AIETLJ,JINLTA
      COMMON/PROPEL/PHALOC,YP,PHVLOC,PRPRAD,NENGSP
      INTEGER PARAMS(30),RUNTYPE
      DIMENSION NRADX(4),NFORX(4)
      DIMENSION X(20),S(20),P(20),R(20),ZU(20),ZL(20)
     .         ,TNAME(8)
      LOGICAL VERTUP
      NAMELIST/OPTINS/ROUGFC,SREF,CBARR,BLREF
      NAMELIST/SYNTHS/XCG,ZCG,XW,ZW,ALIW,XH,ZH,ALIH,XV,XVF,ZV
     .         ,ZVF,SCALE,VERTUP,MINAX
      NAMELIST/BODY/NX,X,S,P,R,ZU,ZL
     .         ,BNOSE,BTAIL,BLN,BLA,DS,ITYPE,METHOD
      NAMELIST/JETPWR/AIETLJ,NENGSJ,THSTCJ,JIALOC,JEVLOC,JEALOC
     .         ,JINLTA,JEANGL,JEVELO,AMBTMP,JESTMP,JELLOC,JETOTP,AMBSTP
     .         ,JERAD
      NAMELIST/PROPWR/AIETLP,NENGSP,THSTCP,PHALOC,PHVLOC,PRPRAD,ENGFCT
     .         ,BWAPR3,BWAPR6,BWAPR9,NOPBPE,BAPR75,YP,CROT
C  JPARAMS IS A SYSTEM  SUBROUTINE THAT RETURNS JOB PARAMETERS
      CALL JPARAMS(PARAMS)
C  PARAMS(2)=3 FOR INTERACTIVE FACILITY RUNS
      RUNTYPE=PARAMS(2)
C  PLOT TITLE AND NAMELIST VALUES ARE READ FROM DATCOM FILE TAPE4
    2 READ(4,102)WORD,TNAME
      IF(WORD.EQ.6HCASEID)GO TO 1
      GO TO 2
    1 REWIND 4
      READ(4,OPTINS)
      REWIND 4
```

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```
      READ(4,SYNTHS)
      REWIND 4
      READ(4,BODY)
      REWIND 4
      READ(4,JETPWR)
      REWIND 4
      READ(4,PROPWR)
C  THE 24 CONTROL INTEGERS NEEDED FOR D2290, THE AIRCRAFT CONFIGURATION
C  PLOTTING PROGRAM, ARE DEFINED.
C  CHECK VALUES OBTAINED FROM NAMELIST OPTINS FOR REFERENCE AREA
      J0=1
C  CHECK VALUES OBTAINED FROM NAMELIST SYNTHS FOR WING DATA
      IF(XW.NE.0.OR.ZW.NE.0)J1=-1
C  CHECK VALUES OBTAINED FROM NAMELIST BODY FOR FUSELAGE DATA
      IF(NX.EQ.0)GO TO 200
      J2=1
C  CHECK VALUES FROM NAMELIST BODY FOR UPPER AND LOWER POINTS ON THE FUSELAGE.
      IF(ZU(2).EQ.0.AND.ZL(2).EQ.0)J2=-1
C  CHECK NUMBER OF JET AND PROPELLER PODS
  200 IF(NENGSJ.NE.0.OR.NENGSP.NE.0)J3=1
C  CHECK VALUES OBTAINED FROM NAMELIST SYNTHS FOR FIN DATA
      J4=1
      IF(XV.EQ.0.AND.ZV.EQ.0.AND.XH.EQ.0.AND.ZH.EQ.0)J4=0
C  CHECK VALUES OBTAINED FROM NAMELIST SYNTHS FOR HORIZONTAL TAIL OR CANARD DATA
      IF(XH.NE.0.OR.ZH.NE.0)J5=1
      DO 50 I=1,4
      NRADX(I)=20
   50 CONTINUE
C  THREE WING AIRFOIL SECTIONS DEFINE THE WING:
C  THE ROOT CHORD SECTION, THE TIP SECTION,
C  AND, IF AN OUTBOARD IS PRESENT, THE BREAKPOINT SECTION.
      NWAF=3
C  10 LOCATIONS ALONG EACH AIRFOIL SECTION WILL DEFINE THE WING SHAPE.
      NWAFOR=10
C  THE NUMBER OF FUSELAGE SECTIONS IS 1
      NFUS=1
C  THE NUMBER OF LOCATIONS ALONG THE X-AXIS WHERE THE FUSELAGE IS DESCRIBED
      NFORX(1)=NX
C THE NUMBER OF PODS IS ONE,(ONLY ONE SIDE OF THE XZ PLANE NEEDS TO BE SPECIFIED
      NP=1
C  4 LOCATIONS ALONG THE POD LENGTH WILL DESCRIBE IT.
      NPODOR=4
C  3 FINS ARE FORESEEN: THE VERTICAL TAIL, AN APPROXIMATION OF THE ROUNDED PART
C  AT THE LEADING EDGE OF THAT TAIL, AND VERTICAL PANELS ON THE HORIZONTAL TAIL.
      NF=3
      IF(XVF.EQ.0.AND.ZVF.EQ.0)NF=NF-1
      IF(XV.EQ.0.AND.ZV.EQ.0)NF=NF-1
      IF(XH.EQ.0.AND.ZH.EQ.0)NF=NF-1
      IF(XVF.EQ.0.AND.ZVF.EQ.0)NF=2
C  ONE CANARD OR HORIZONTAL TAIL IS PLOTTED
      NFINOR=10
C  THE HORIZONTAL TAIL IS DEFINED AT 10 LOCATIONS ALONG ITS AIRFOIL SECTION
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      NCAN=1
      NCANOR=10
C  NO PRINT STATEMENTS IN BATCH RUNS
      IF(RUNTYPE.NE.3)GO TO 301
      PRINT*," PLOT WITH DEFAULT PARAMETERS? (Y/N)"
C  OPTION TO PLOT TOTAL CONFIGURATION DESCRIBED IN TAPE4
C  IN ORTHOGONAL AND TRIPLE VIEWS,
C  OR TO PLOT PARTS OF AIRCRAFT,
C  AND CHOOSE OTHER TYPES OF PLOTS.
  301 READ 101,DEFLT
      IF(DEFLT.EQ.1HY)GO TO 300
      IF(RUNTYPE.NE.3)GO TO 302
      PRINT*,"PLOT COMPLETE CONFIGURATION? (Y/N)"
  302 READ 101,ANSWER
      IF(ANSWER.EQ.1HY)GO TO 300
      IF(RUNTYPE.EQ.3)GO TO 303
C  FOR BATCH RUNS, THE PLOT TITLE AND CONFIGURATION OPTIONS ARE READ FROM INPUT
      READ 112,TNAME
      READ 110, J0,J1,J2,J3,J4,J5,J6,NWAF,NWAFOR,NFUS,NRADX(1),
     . NFORX(1),NRADX(2),NFORX(2),NRADX(3),NFORX(3),NRADX(4),NFORX(4),
     . NP,NPODOR,NF,NFINOR,NCAN,NCANOR
      GO TO 300
C  FOR INTERACTIVE RUNS, THE CONFIGURATION OPTIONS WILL BE DETERMINED THROUGH
C  A CALL TO SUBROUTINE OPTIONS.
  303 CALL OPTIONS
C  THE FIRST 3 LINES ARE WRITTEN ON TAPE7
  300 WRITE(7,100)TNAME
      WRITE(7,110) J0,J1,J2,J3,J4,J5,J6,NWAF,NWAFOR,NFUS,NRADX(1),
     . NFORX(1),NRADX(2),NFORX(2),NRADX(3),NFORX(3),NRADX(4),NFORX(4),
     . NP,NPODOR,NF,NFINOR,NCAN,NCANOR
      WRITE(7,120)SREF
C  SUBROUTINES ARE CALLED TO WRITE DATA FOR PLOTTING WINGS, FUSELAGE, PODS,
C  AND VERTICAL TAIL.
      IF(J1.EQ.-1)CALL WRITWNG
      IF(J2.NE.0)CALL WRITFUS(J2)
      IF(J3.EQ.1)CALL WRITPOD
      IF(J4.EQ.1.AND.NF.GT.1)CALL WRITFIN
C  SUBROUTINE WRITCAN WRITES DATA TO PLOT VERTICAL PANELS ON HORIZONTAL TAIL,
C  AND HORIZONTAL TAIL.
      CALL WRITCAN(J4,J5)
C  SUBROUTINE PLTCARD IS CALLED TO WRITE PLOTTING VIEW INSTRUCTIONS.
      CALL PLTCARD
      IF(RUNTYPE.NE.3)STOP
C  MESSAGE FOR INTERACTIVE USER,WARNING OF NEED TO STAND BY,
C  WHILE D2290 READS TAPE7 AND WRITES THE PLOT VECTOR FILE SAVPLT.
      PRINT*,"A PLOT VECTOR FILE IS NOW BEING CREATED."
      PRINT*,"               PLEASE STAND BY       "
      STOP
  100 FORMAT(7X,8A10)
  101 FORMAT(A1)
  102 FORMAT(A6,1X,8A10)
  110 FORMAT(24I3)
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112 FORMAT(8A10)
120 FORMAT(F7.1,T73,"REF AREA")
    END
```

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```
      SUBROUTINE OPTIONS
C  SUBROUTINE OPTIONS DETERMINES THE CONTROL INTEGERS WHEN THE DEFAULT VALUES
C  FOR THE CONFIGURATION ARE NOT ACCEPTED.
      COMMON/FIN/XV,ZV,NF
      COMMON/NS/NP,NPODOR,NCAN,TNAME
      COMMON/JAYS/J0,J1,J2,J3,J4,J5,J6
      COMMON/WG/NWAF,NWAFOR,XW,ZW,ALIW
      DIMENSION TNAME(8)
      PRINT*," TYPE THE PLOT TITLE:"
      READ 100,TNAME
  100 FORMAT(8A10)
  251 PRINT*," WING  : "
      PRINT*,"   TYPE 0  IF  NO WING ,"
      PRINT*,"        1  FOR WING ,"
      READ *,J1
      IF(J1.EQ.1)J1=-1
      IF(J1.EQ.-1.OR.J1.EQ.0)GO TO 51
      PRINT*,J1," NOT VALID CHOICE.  PLEASE ENTER 0 OR 1:"
      GO TO 251
   51 PRINT*," FUSELAGE  : "
      PRINT*,"   TYPE 0  IF  NO FUSELAGE , "
      PRINT*,"        1  FOR FUSELAGE,"
      READ*,JD
      IF(JD.EQ.0)J2=0
      IF(J2.EQ.0)GO TO 152
C  IF FUSELAGE IS DESIRED,  THE VALUE OF J2 DEFINED BY THE MAIN PROGRAM IS KEPT
      IF(JD.EQ.1)GO TO 152
      PRINT*,JD," NOT VALID CHOICE.  PLEASE ENTER 0 OR 1:"
      GO TO 51
  152 PRINT*," POD  : "
      PRINT*,"   TYPE 0  IF  NO POD ,"
      PRINT*,"        1  FOR PODS,"
      READ*,J3
      IF(J3.EQ.0)GO TO 153
      IF(J3.EQ.1)GO TO 153
      PRINT*,J3," NOT VALID CHOICE.  PLEASE ENTER 0 OR 1:"
      GO TO 152
C  IF FUSELAGE IS PLOTTED,VERTICAL FINS ARE PLOTTED TOO.
  153 IF(JD.EQ.1)GO TO 154
      PRINT*," VERTICAL TAIL AND FINS : "
      PRINT*,"   TYPE 0  IF  NO VERTICAL TAIL, AND NO FIN ,"
      PRINT*,"        1  FOR VERTICAL TAIL AND/OR FINS, "
      READ*,J4
      IF(J4.EQ.0)GO TO 54
      IF(J4.EQ.1)GO TO 54
      PRINT*,J4," NOT VALID CHOICE.  PLEASE ENTER 0 OR 1:"
      GO TO 153
  154 J4=1
   54 PRINT*," HORIZONTAL TAIL, OR CANARD :"
      PRINT*,"   TYPE 0  IF  NO HORIZONTAL TAIL, AND NO CANARD,"
      PRINT*,"        1  FOR HORIZONTAL TAIL OR CANARD,"
      READ*,J5
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      IF(J5.EQ.0)GO TO 155
      IF(J5.EQ.1)GO TO 155
      PRINT*,J5," NOT VALID CHOICE.  PLEASE ENTER 0 OR 1:"
      GO TO 54
  155 J6=0
      RETURN
      END
```

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```
      SUBROUTINE WRITWNG
C SUBROUTINE WRITWNG WRITES WING DATA ON TAPE7.
      COMMON/WG/NWAF,NWAFOR,XW,ZW,ALIW
      DIMENSION WXORD(10),WYORD(10)
     .          ,SHB(20),SEXT(20),RLPH(20),SVWB(20),SVB(20),SVHB(20)
      NAMELIST/WGPLNF/CHRDTP,SSPNOP,SSPNE,SSPN,CHRDBP,CHRDR
     .          ,SAVSI,SAVSO,CHSTAT,TWISTA,SSPNDD,DHDADI,DHDADO,TYPE
     .          ,SHB,SEXT,RLPH,SVWB,SVB,SVHB
      DATA WXORD/0.,1.25,5.,10.,15.,20.,30.,50.,70.,100./
      DATA WYORD/0.,1.89,3.56,4.68,5.34,5.74,6.00,5.29,3.66,0.13/
      REWIND 4
      READ(4,WGPLNF)
C PERCENT CHORD LOCATIONS ALONG AIRFOIL SECTION,WHERE
C AIRFOIL THICKNESS WILL BE DEFINED.
      WRITE(7,130) WXORD
      YW=0
      WRITE(7,100)XW,YW,ZW,CHRDR
C IF THE WING HAS AN OUTBOARD SECTION, THE COORDINATES OF THE BREAKPOINT
C ARE CALCULATED AND WRITTEN ON TAPE7.
      IF(SSPNOP.EQ.0)GO TO 200
      SSPNI=SSPN-SSPNOP
      XBP=XW+(CHRDR-CHRDBP)/4+SSPNI*TAN(SAVSI/57.296)
      YBP=SSPNI
      ZBP=ZW+SSPNI*TAN(DHDADI/57.296)
      WRITE(7,100)XBP,YBP,ZBP,CHRDBP
C THE COORDINATES OF THE WING TIP ARE CALCULATED, AND WRITTEN ON TAPE7.
      XTIP=XBP+(CHRDBP-CHRDTP)/4+SSPNOP*TAN(SAVSO/57.296)
      YTIP=SSPN
      ZTIP=ZBP+SSPNOP*TAN(DHDADO/57.296)
      GO TO 201
C WHEN THERE IS NO OUTBOARD WING SECTION, THE WING TIP COORDINATES ARE CALCULA-
C ED AND WRITTEN ON TAPE7, TWICE, SIMULATING AN OUTBOARD SECTION OF ZERO LENGTH
  200 XTIP=XW+(CHRDR-CHRDTP)/4+SSPN*TAN(SAVSI/57.296)
      YTIP=SSPN
      ZTIP=ZW+SSPN*TAN(DHDADI/57.296)
      WRITE(7,100) XTIP,YTIP,ZTIP,CHRDTP
  201 WRITE(7,100) XTIP,YTIP,ZTIP,CHRDTP
C THE THICKNESSES AT THE PERCENT CHORD LOCATIONS ARE WRITTEN ON TAPE7,
C FOR EACH OF THE THREE AIRFOILS.
      WRITE(7,140)WYORD
      WRITE(7,140)WYORD
      WRITE(7,140)WYORD
  100 FORMAT(4F7.2,T73,"WING DIMS")
  130 FORMAT(10F7.2,T73,"WING %CHORD")
  140 FORMAT(10F7.2,T73,"WNG THICKNESS")
      RETURN
      END
```

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```
      SUBROUTINE WRITFUS(J2)
C SUBROUTINE WRITFUS WRITES FUSELAGE DATA ON TAPE7.
      DIMENSION NRADX(4),NFORX(4),Y(20),Z(20),ZU(20),ZL(20),R(20)
      DIMENSION X(20),S(20),ZC(20)
      COMMON/FUSL/NRADX,NFORX,NX,ZU,ZL,R,X,S
C THE LOCATION OF FUSELAGE SECTIONS TO BE DESCRIBED IS WRITTEN ON TAPE7.
      WRITE(7,160)(X(I),I=1,NX)
  160 FORMAT(10(F7.2),T73,"X FUSLG")
C IF THE UPPER AND LOWER POINTS OF THE FUSELAGE ARE GIVEN, AN ELLIPTICAL
C CROSS SECTION WILL BE DRAWN, FITTED THROUGH THESE POINTS.
C OTHERWISE, A CIRCULAR FUSELAGE WILL BE DRAWN.
      IF(J2.EQ.-1)GO TO 30
C THE CENTER OF EACH FUSELAGE CROSS SECTION IS CALCULATED.
      DO 302 I=1,NX
      ZC(I)=(ZU(I)+ZL(I))*.5
  302 CONTINUE
      DO 200 J=1,NX
      W=R(J)
      H=(ZU(J)-ZL(J))*.5
      WW=W*W
      IF(W.EQ.0)WW=W
      HH=H*H
      IF(H.EQ.0)HH=H
      WH=0
      IF(W.NE.0.AND.H.NE.0)WH=W*H
      GX2=3.1416/19
C THE Z AND Y COORDINATES OF 20 POINTS ALONG THE PERIPHERY OF THE
C HALF CROSS SECTION ARE CALCULATED.
      DO 201 K=1,20
      THETA=(K-1)*GX2
      RHO=0
      IF(WH.EQ.0)GO TO 13
      RHO=WH/((HH*(SIN(THETA)**2)+WW*(COS(THETA)**2))**0.5)
   13 Z(K)=RHO*COS(THETA)+ZC(J)
      Y(K)=RHO*SIN(THETA)
  201 CONTINUE
C THE Z AND Y COORDINATES OF THE 20 POINTS THAT DEFINE EACH CROSS SECTION
C ARE WRITTEN ON TAPE7.
      WRITE(7,165)(Y(K),K=1,20)
      WRITE(7,166)(Z(K),K=1,20)
  165 FORMAT(10(F7.2),T73,"Y FUSLG")
  166 FORMAT(10(F7.2),T73,"Z FUSLG")
  167 FORMAT(10F7.2,T73,"CROSS.FUSLG")
  168 FORMAT(10F7.2,T73,"ZC FUSLG")
  200 CONTINUE
      RETURN
   30 CONTINUE
C WHEN ZU AND ZL ARE NOT DEFINED, CENTERS AND AREAS OF EACH FUSELAGE CROSS
C SECTION ARE WRITTEN ON TAPE7, FOR CIRCULAR CROSS SECTIONS.
      WRITE(7,168)(ZC(I),I=1,NX)
      WRITE(7,167)(S(I),I=1,NX)
      RETURN
      END
```

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      SUBROUTINE WRITPOD
C  SUBROUTINE WRITPOD WRITES POD DATA (1 OR 2 JET OR PROPELLER PODS) ON TAPE7.
      COMMON/JET/NENGSJ,JIALOC,JELLOC,JEVLOC,JEALOC,AIETLJ,JINLTA
C  IF THE NUMBER OF JET ENGINES IS ZERO,  ROUTINE READPOD THAT WRITES
C  THE PROPELLER POD DATA IS CALLED.
      IF(NENGSJ.EQ.0)GO TO 200
      XO=JIALOC
      YO=JELLOC
      ZO=JEVLOC-(JEALOC-JIALOC)*TAN(AIETLJ/57.296)
      XLOCS=(JEALOC-JIALOC)*COS(AIETLJ/57.296)
      RAD=(JINLTA/3.14)**.5
C  WRITE THE COORDINATES OF THE JET ENGINE INLET.
      WRITE(7,100)XO,YO,ZO
C  WRITE THE LOCATIONS ALONG THE JET AXIS, THAT WILL BE SPECIFIED.
      WRITE(7,101)0*XLOCS,XLOCS*.33,XLOCS*.66,XLOCS
C  WRITE THE RADIUS OF THE PODS AT THE ABOVE LOCATIONS.
      WRITE(7,101).8*RAD,RAD,RAD,.7*RAD
  100 FORMAT(3F7.1,T73,"JET ORIG")
  101 FORMAT(4F7.1,T73,"JET DATA")
      RETURN
  200 CALL WRITPRP
      RETURN
      END
```

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```
      SUBROUTINE WRITPRP
C  SUBROUTINE WRITPRP WRITES PROPELLER POD DATA ON TAPE7.
      COMMON/PROPEL/PHALOC,YP,PHVLOC,PRPRAD,NENGSP
      WRITE(7,100)PHALOC,YP,PHVLOC
      WRITF(7,101)0,PRPRAD,2*PRPRAD,3*PRPRAD
      WRITE(7,101)0.35*PRPRAD,0.35*PRPRAD,0.34*PRPRAD,.30*PRPRAD
  100 FORMAT(3F7.1,T73,"PROP POD")
  101 FORMAT(4F7.1,T73,"PROP DATA")
      RETURN
      END
```

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```
      SUBROUTINE WRITFIN
C  SUBROUTINE WRITFIN WRITES VERTICAL TAIL DATA ON TAPE7.
      COMMON/FIN/XV,ZV,NF
      DIMENSION XPRCT(10),YPRCT(10)
     .          ,SHB(20),SEXT(20),RLPH(20),SVWB(20),SVB(20),SVHB(20)
      NAMELIST/VTPLNF/CHRDTP,SSPNOP,SSPNE,SSPN,CHRDBP,CHRDR
     .          ,SAVSI,SAVSO,CHSTAT,TWISTA,SSPNDD,DHDADI,DHDADO,TYPE
     .          ,SHB,SEXT,RLPH,SVWB,SVB,SVHB
      DATA XPRCT/0.,1.25,5.,10.,15.,20.,30.,50.,70.,100./
      DATA YPRCT/0.,1.89,3.56,4.68,5.34,5.74,6.00,5.29,3.66,0.13/
      REWIND 4
      READ(4,VTPLNF)
      YV=0
      XTIP=XV+(CHRDR-CHRDTP)/4+SSPN*TAN(SAVSI/57.296)
      YTIP=0
      ZTIP=ZV+SSPN
      WRITE(7,100)XV,YV,ZV,CHRDR,XTIP,YTIP,ZTIP,CHRDTP
      WRITE(7,101)XPRCT
      WRITE(7,101)YPRCT
  100 FORMAT(8F7.2,T73,"FIN DATA")
  101 FORMAT(10F7.2,T73,"FIN DIMS")
C  TAPE4 IS CHECKED FOR VERTICAL TAIL SECTION DATA.
      IF(NF.LT.3)RETURN
C  CONTROL INTEGER NF DETERMINES IF A FIN, APPROXIMATING THE ROUNDED
C  SECTION OF THE VERTICAL TAIL, IS TO BE PLOTTED.
      CALL WRITF2(XTIP,ZTIP)
      RETURN
      END
```

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      SUBROUTINE WRITF2(XTIP,ZTIP)
C  SUBROUTINE WRITF2 WRITES DATA FOR A FIN THAT APPROXIMATES THE ROUNDED
C  SECTION OF THE VERTICAL TAIL LEADING EDGE, WHERE IT JOINS THE FUSELAGE.
      COMMON/FUSL/NRADX,NFORX,NX,ZU,ZL,R,X,S
      COMMON/F2/XVF,ZVF
      COMMON/FIN/XV,ZV,NF
      DIMENSION X(20),S(20),R(20),ZU(20),ZL(20),NRADX(4),NFORX(4)
      DIMENSION XPRCT(10),YPRCT(10)
      DATA XPRCT/0.,1.25,5.,10.,15.,20.,30.,50.,70.,100./
      DATA YPRCT/10*2./
C  XVF IS ASSUMED TO BE THE LOCATION ALONG THE X-AXIS WHERE THE TAIL SECTION
C  MEETS THE FUSELAGE.
      YVFL=0
C  ZVFL, THE LOCATION ALONG THE Z-AXIS WHERE THE TAIL SECTION MEETS THE FUSELAGE
C  IS CALCULATED.
      DO 200 I=1,NX
      IF(XVF.LT.X(I))GO TO 20
  200 CONTINUE
   20 IF(ZU(2).EQ.0.0.AND.ZL(2).EQ.0.0)GO TO 21
      ZVFL=ZU(I-1)-(ZU(I-1)-ZU(I))*(XVF-X(I-1))/(X(I)-X(I-1))
      GO TO 22
   21 ZVFL=R(I-1)-(R(I-1)-R(I))*(XVF-X(I-1))/(X(I)-X(I-1))
C  ZVF IS ASSUMED TO BE THE LOCATION ALONG THE Z-AXIS WHERE THE TAIL SECTION
C  MEETS THE TAIL.
C  XVFU, THE LOCATION ALONG THE X-AXIS WHERE THE TAIL SECTION MEETS THE TAIL,
C  IS CALCULATED.
   22 XVFU=XV+(ZVF-ZV)*(XTIP-XV)/(ZTIP-ZV)
      YVFU=0
      CHRDR=XVFU-XVF
      CHRDTP=CHRDR*.1
      WRITE(7,100)XVF,YVFL,ZVFL,CHRDR,XVFU,YVFU,ZVF,CHRDTP
      WRITE(7,101)XPRCT
      WRITE(7,101)YPRCT
  100 FORMAT(8F7.2,T73,"SUB FIN")
  101 FORMAT(10F7.2,T73,"SUB FIN DIMS")
      RETURN
      END
```

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      SUBROUTINE WRITCAN(J4,J5)
C SUBROUTINE WRITCAN WRITES DATA FOR THE VERTICAL PANELS ON THE HORIZONTAL TAIL
C AND FOR THE HORIZONTAL TAIL.
      COMMON/CANARD/XH,ZH,ALJH
      DIMENSION XPRCT(10),YPRCT(10)
     .          ,SHB(20),SEXT(20),RLPH(20),SVWB(20),SVB(20),SVHB(20)
      NAMELIST/HTPLNF/CHRDTP,SSPNOP,SSPNE,SSPN,CHRDBP,CHRDR
     .          ,SAVSI,SAVSO,CHSTAT,TWISTA,SSPNDD,DHDADI,DHDADO,TYPE
     .          ,SHB,SEXT,RLPH,SVWB,SVB,SVHB
      DATA XPRCT/0.,1.25,5.,10.,15.,20.,30.,50.,70.,100./
      DATA YPRCT/0.,1.89,3.56,4.68,5.34,5.74,6.00,5.29,3.66,0.13/
      REWIND 4
      READ(4,HTPLNF)
      YH=0
C IF THE HORIZONTAL TAIL OR CANARD HAS VERTICAL SECTIONS,
C THE OUTBOARD WILL BE DEFINED FIRST AND THE DATA FOR IT
C WRITTEN ON TAPE7 WHERE IT WILL BE READ IN AS FINS.
      IF(CHRDBP.EQ.0)GO TO 200
      XTIP=XH+(CHRDR-CHRDBP)/4+SSPN*TAN(SAVSI/57.296)
      YTIP=SSPN
      ZTIP=ZH+(SSPN)*TAN(DHDADI/57.296)
      XTOP=XTIP+(CHRDBP-CHRDTP)/4+SSPNOP*TAN(SAVSO/57.296)
      YTOP=YTIP
      IF(TAN(DHDADO).NE.0)YTOP=YTIP+SSPNOP/TAN(DHDADO/57.296)
      ZTOP=ZTIP+SSPNOP
      IF(J4.EQ.0)GO TO 50
C THREE CARDS ARE WRITTEN ON TAPE7 TO SPECIFY THE VERTICAL FIN.
      WRITE(7,110)XTIP,YTIP,ZTIP,CHRDBP,XTOP,YTOP,ZTOP,CHRDTP
      WRITE(7,111)XPRCT
      WRITE(7,111)YPRCT
   50 IF(J5.EQ.0)RETURN
C THREE CARDS ARE WRITTEN ON TAPE7 TO DESCRIBE THE HORIZONTAL TAIL.
      WRITE(7,100)XH,YH,ZH,CHRDR,XTIP,YTIP,ZTIP,CHRDBP
      WRITE(7,101)XPRCT
      WRITE(7,101)YPRCT
      RETURN
  200 IF(J4.EQ.0)GO TO 51
C IF THERE IS NO VERTICAL TAIL SECTION, ZERO VALUES WILL BE
C INPUT FOR THE COORDINATES OF THESE FINS, AND THE AIRFOIL
C SECTIONS WILL BE SPECIFIED AND WRITTEN ON TAPE7.
      WRITE(7,110)YH,YH,YH,YH,YH,YH,YH,YH
      WRITE(7,111)XPRCT
      WRITE(7,111)YPRCT
   51 XTIP=XH+(CHRDR-CHRDTP)/4+SSPN*TAN(SAVSI/57.296)
      YTIP=SSPN
      ZTIP=ZH+SSPN*TAN(DHDADI/57.296)
      IF(J5.EQ.0)RETURN
C THREE CARDS ARE WRITTEN ON TAPE7 TO DESCRIBE THE HORIZONTAL TAIL,
C IN THE ABSENCE OF FINS.
      WRITE(7,100)XH,YH,ZH,CHRDR,XTIP,YTIP,ZTIP,CHRDTP
      WRITE(7,101)XPRCT
      WRITE(7,101)YPRCT
```

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```
100 FORMAT(8F7.2,T73,"CAN DATA")
101 FORMAT(10F7.2,T73,"CAN DIMS")
110 FORMAT(8F7.2,T73,"TAIL FIN")
111 FORMAT(10F7.2,T73,"TAIL FIN")
    RETURN
    END
```

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```
      SUBROUTINE PLTCARD
C  SUBROUTINE PLTCARD COLLECTS INSTRUCTIONS FOR PLOTTING VIEWS.
      INTEGER RUNTYPE
      COMMON/RUNS/RUNTYPE,DEFLT
      COMMON/KODE/KODE
      IF(DEFLT.EQ.1HY)GO TO 11
      IF(RUNTYPE.NE.3)GO TO 12
C  IN INTERACTIVE RUNS, OPTION IS GIVEN FOR PLOTS.
      PRINT*,"DEFAULT VIEWS OF CONFIGURATION? (Y/N)"
      READ 101,DEFAULT
      IF(DEFAULT.NE.1HY)GO TO 14
C  IF DEFAULT VALUES WERE CHOSEN, INSTRUCTIONS FOR THE DEFAULT PLOTS ARE WRITTEN
   11 WRITE(7,105)
      RETURN
   10 IF(RUNTYPE.NE.3)GO TO 12
C  THERE ARE 4 VIEWING OPTIONS.
   14 PRINT*," TYPE  ORT FOR ORTHOGRAPHIC PLOTS,"
      PRINT*,"       VU3     STACKED PLAN,FRONT AND SIDE VIEWS,"
      PRINT*,"       PER     PERSPECTIVE VIEWS,"
      PRINT*,"       STE     STEREO VIEWS."
   12 READ 100,VIEW
   13 IF(VIEW.EQ.3HORT)CALL OFTCARD
      IF(VIEW.EQ.3HVU3)CALL VU3CARD
      IF(VIEW.EQ.3HPER.OR.VIEW.EQ.3HSTE)CALL PERSTEC(VIEW)
C  KODE INDICATES WHETHER MORE PLOTS ARE WANTED.
      IF(KODE.EQ.0)GO TO 10
      RETURN
  100 FORMAT(A3)
  101 FORMAT(A1)
  105 FORMAT(
     .,"X Z OUT-45.030.00-20.0                            8.0 ORT",
     .T72,"0",
     .,/"        8.0  2.0  4.0                             5.00VU3",
     .T72,"1")
      END
```

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```
      SUBROUTINE ORTCARD
C  SUBROUTINE ORTCARD WRITES INSTRUCTIONS FOR ORTHOGONAL VIEWS.
      INTEGER RUNTYPE
      COMMON/KODE/KODE
      COMMON/RUNS/RUNTYPE,DEFLT
      IF(RUNTYPE.EQ.3)GO TO 10
C  FOR BATCH RUNS, THE PLOTTING INSTRUCTIONS FOR AN ORTHOGONAL VIEW ARE READ
C  FROM INPUT
      READ 105,HORZ,VERT,TEST1,PHI,THETA,PSI,PLOTSZ,KODE
      GO TO 11
C  FOR INTERACTIVE RUNS, OPTIONS ARE GATHERED.
   10 PRINT*,"TYPE  X,Y,OR Z  FOR HORIZONTAL AXIS, (EXAMPLE:X)"
      READ 101,HORZ
      IF(HORZ.EQ.1HX.OR.HORZ.EQ.1HY.OR.HORZ.EQ.1HZ)GO TO 12
      PRINT*,"CHOICE NOT VALID.  PLEASE ENTER CORRECT CHOICE :"
      GO TO 10
   12 PRINT*," TYPE  X,Y,OR Z  FOR VERTICAL AXIS, (EXAMPLE:Z)"
      READ 101,VERT
      IF(VERT.EQ.1HX.OR.VERT.EQ.1HY.OR.VERT.EQ.1HZ)GO TO 13
      PRINT*,"CHOICE NOT VALID.  PLEASE ENTER CORRECT CHOICE :"
      GO TO 12
   13 PRINT*," TYPE  OUT  FOR DELETION OF HIDDEN LINES,"
      PRINT*,"    ELSE TYPE BLANKS."
      READ 102,TEST1
      IF(TEST1.EQ.3HOUT.OR.TEST1.EQ.3H   )GO TO 14
      PRINT*,"ENTRY NOT VALID.  PLEASE ENTER OUT OR BLANK SPACES :"
      GO TO 13
   14 PRINT*," TYPE ROLL ANGLE, IN DEGREES, (EXAMPLE:-45)"
      READ*,PHI
      PRINT*,"TYPE PITCH ANGLE, IN DEGREES, (EXAMPLE:30)"
      READ*,THETA
      PRINT*," TYPE YAW ANGLE, IN DEGREES, (EXAMPLE:-20)"
      READ*,PSI
      PRINT*," TYPE PLOTSIZE, (EXAMPLE:8.0)"
      READ*,PLOTSZ
      PRINT*," ARE MORE PLOTS WANTED? (Y/N)"
      READ 101,MORE
      KODE=1
      IF(MORE.EQ.1HY)KODE=0
C  THE PLOTTING INSTRUCTIONS ARE  WRITTEN ON TAPE7.
   11 WRITE(7,105)HORZ,VERT,TEST1,PHI,THETA,PSI,PLOTSZ,KODE
  105 FORMAT(A1,1X,A1,1X,,A3,3(F5.1),T48,F5.1,"ORT",T72,I1)
  101 FORMAT(A1)
  102 FORMAT(A3)
      RETURN
      END
```

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```
      SUBROUTINE VU3CARD
C  SUBROUTINE VU3CARD WRITES INSTRUCTIONS FOR PLOTTING THREE VIEWS IN ONE:
C  FROM TOP, FROM FRONT,FROM SIDE.
      INTEGER RUNTYPE
      COMMON/KODE/KODE
      COMMON/RUNS/RUNTYPE,DEFLT
      IF(RUNTYPE.EQ.3)GO TO 10
C  FOR BATCH RUNS, THE PLOTTING INSTRUCTIONS FOR THE 3 VIEWS ARE READ FROM INPUT
      READ 106,PHI,THETA,PSI,PLOTSZ,KODE
      GO TO 11
C  FOR INTERACTIVE RUNS, OPTIONS ARE GATHERED.
   10 PRINT*," TYPE Y-ORIGIN ON SCREEN, OF VIEW FROM TOP, (EXAMPLE:8.0)"
      READ*,PHI
      PRINT*," TYPE Y-ORIGIN ON SCREEN, OF SIDE VIEW (EXAMPLE:2.0)"
      READ*,THETA
      PRINT*," TYPE Y-ORIGIN ON SCREEN OF FRONT VIEW, (EXAMPLE:4.0)"
      READ*,PSI
      PRINT*," TYPE PLOTSIZE, (EXAMPLE:5.)"
      READ*,PLOTSZ
      PRINT*," ARE MORE PLOTS WANTED? (Y/N)"
      READ 101,MORE
      KODE=1
      IF(MORE.EQ 1HY)KODE=0
  101 FORMAT(A1)
C  THE PLOTTING INSTRUCTIONS ARE WRITTEN ON TAPE7.
   11 WRITE(7,106)PHI,THETA,PSI,PLOTSZ,KODE
  106 FORMAT(7X,3F5.1,T48,F5.1,"VU3",T72,I1)
      RETURN
      END
```

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```
      SUBROUTINE PERSTEC(TYPE)
C  SUBROUTINE PERSTEC WRITES INSTRUCTIONS FOR PLOTTING SINGLE OR
C  STEREO PERSPECTIVE VIEWS OF CONFIGURATION.
      INTEGER RUNTYPE
      COMMON/KODE/KODE
      COMMON/RUNS/RUNTYPE,DEFLT
C  FOR BATCH RUNS, PLOTTING INSTRUCTIONS ARE READ FROM INPUT.
      IF(RUNTYPE.EQ.3)GO TO 10
      READ 107,XV,YV,ZV,XF,YF,ZF,DIST,FMAG,PLOTSZ,TYPE,KODE
      GO TO 11
C  FOR INTERACTIVE RUNS, OPTIONS ARE GATHERED.
   10 PRINT*," TYPE X,Y AND Z VALUES OF VIEW POINT, (EXAMPLE:75,0,45)"
      READ*,XV,YV,ZV
      PRINT*," TYPE X,Y AND Z VALUES OF FOCAL POINT, (EXAMPLE:0,0,0)"
      READ*,XF,YF,ZF
      PRINT*," TYPE DISTANCE FROM EYE TO VIEWING PLANE,(EXAMPLE:12.0)"
      READ*,DIST
      PRINT*," TYPE VIEWING PLANE MAGNIFICATION FACTOR, (EXAMPLE:2.0)"
      READ*,FMAG
      PRINT*," TYPE PLOTSIZE, (EXAMPLE:10.0)"
      READ*,PLOTSZ
      PRINT*," ARE MORE PLOTS WANTED? (Y/N)"
      READ 101,MORE
      KODE=1
      IF(MORE.EQ.1HY)KODE=0
  101 FORMAT(A1)
C  THE PLOTTING INSTRUCTIONS ARE WRITTEN ON TAPE7.
   11 WRITE(7,107)XV,YV,ZV,XF,YF,ZF,DIST,FMAG,PLOTSZ,TYPE,KODE
  107 FORMAT(7X,6F5.0,3F5.1,A3,T72,I1)
      RETURN
      END
```

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APPENDIX III - Input Decks for the Airplane Configuration Plotting Program.

Input to D2290 for the Complete Navion Configuration. (see figures 1a and 1b)

```
    NAVION WITH ELEVATORS AND NO FLAPS OR AILERON DEFLECTIONS
1 -1  1  0  1  1  0  3 10  1 20 18 20  0 20  0 20  0  1  4  3 10  1 10
184.0                                                                  REF AREA
0.00   1.25   5.00  10.00  15.00  20.00  30.00  50.00  70.00 100.00   WING %CH
5.80   0.00  -2.12   7.29                                             WING DIM
6.98  16.70    .38   3.73                                             WING DIM
6.98  16.70    .38   3.73                                             WING DIM
0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
0.00    .31    .67   2.35   4.08   5.45   6.12   6.94   7.64   8.31   X FUSLG
9.84  11.06  12.51  14.19  17.33  20.50  23.64  27.76
0.00    .17    .34    .50    .66    .81    .94   1.05   1.13   1.17   Y FUSLG
1.17   1.13   1.05    .94    .81    .66    .50    .34    .17   -.00   Y FUSLG
1.02   1.01    .98    .92    .84    .74    .61    .46    .29    .10   Z FUSLG
-.10   -.29   -.46   -.61   -.74   -.84   -.92   -.98  -1.01  -1.02   Z FUSLG
0.00    .23    .45    .66    .87   1.05   1.22   1.35   1.44   1.48   Y FUSLG
1.48   1.44   1.35   1.22   1.05    .87    .66    .45    .23   -.00   Y FUSLG
1.37   1.36   1.31   1.23   1.12    .97    .79    .59    .36    .12   Z FUSLG
-.12   -.36   -.59   -.79   -.97  -1.12  -1.23  -1.31  -1.36  -1.37   Z FUSLG
0.00    .25    .49    .72    .93   1.13   1.29   1.42   1.52   1.56   Y FUSLG
1.56   1.52   1.42   1.29   1.13    .93    .72    .49    .25   -.00   Y FUSLG
1.49   1.47   1.42   1.33   1.20   1.04    .84    .62    .38    .13   Z FUSLG
-.13   -.38   -.62   -.84  -1.04  -1.20  -1.33  -1.42  -1.47  -1.49   Z FUSLG
0.00    .29    .57    .84   1.09   1.31   1.50   1.65   1.75   1.80   Y FUSLG
1.80   1.75   1.65   1.50   1.31   1.09    .84    .57    .29   -.00   Y FUSLG
1.76   1.74   1.67   1.56   1.40   1.21    .98    .72    .44    .15   Z FUSLG
-.15   -.44   -.72   -.98  -1.21  -1.40  -1.56  -1.67  -1.74  -1.76   Z FUSLG
0.00    .34    .66    .97   1.24   1.48   1.66   1.84   1.9[illegible]   1.99   Y FUSLG
1.99   1.94   1.84   1.68   1.48   1.24    .97    .66    .34   -.00   Y FUSLG
2.04   2.01   1.92   1.78   1.60   1.37   1.10    .81    .49    .17   Z FUSLG
-.17   -.49   -.81  -1.10  -1.37  -1.60  -1.78  -1.92  -2.01  -2.04   Z FUSLG
0.00    .35    .68   1.00   1.29   1.54   1.76   1.92   2.03   2.09   Y FUSLG
2.09   2.03   1.92   1.76   1.54   1.29   1.00    .68    .35   -.00   Y FUSLG
2.08   2.05   1.96   1.83   1.64   1.40   1.13    .82    .50    .15   Z FUSLG
-.19   -.53   -.86  -1.17  -1.44  -1.67  -1.86  -2.00  -2.09  -2.12   Z FUSLG
0.00    .38    .75   1.09   1.39   1.64   1.85   2.00   2.10   2.15   Y FUSLG
2.15   2.10   2.00   1.85   1.64   1.39   1.09    .75    .38   -.00   Y FUSLG
2.51   2.47   2.36   2.19   1.96   1.69   1.38   1.05    .71    .35   Z FUSLG
-.00   -.36   -.70  -1.03  -1.34  -1.61  -1.84  -2.01  -2.12  -2.16   Z FUSLG
0.00    .42    .82   1.18   1.48   1.72   1.91   2.04   2.13   2.17   Y FUSLG
2.17   2.13   2.04   1.91   1.72   1.48   1.18    .82    .42   -.00   Y FUSLG
2.98   2.93   2.79   2.57   2.29   1.98   1.64   1.29    .93    .57   Z FUSLG
```

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.21	-.15	-.50	-.85	-1.19	-1.51	-1.78	-2.00	-2.15	-2.19	Z FUSLG
0.00	.44	.85	1.21	1.51	1.76	1.95	2.08	2.17	2.21	Y FUSLG
2.21	2.17	2.08	1.95	1.76	1.51	1.21	.85	.44	-.00	Y FUSLG
3.14	3.08	2.93	2.70	2.42	2.09	1.74	1.38	1.02	.65	Z FUSLG
.29	-.08	-.44	-.80	-1.15	-1.47	-1.76	-1.99	-2.14	-2.19	Z FUSLG
0.00	.44	.86	1.22	1.53	1.77	1.95	2.08	2.17	2.21	Y FUSLG
2.21	2.17	2.08	1.95	1.77	1.53	1.22	.86	.44	-.00	Y FUSLG
3.22	3.16	3.00	2.77	2.47	2.14	1.79	1.42	1.06	.69	Z FUSLG
.33	-.04	-.40	-.77	-1.12	-1.45	-1.75	-1.98	-2.14	-2.19	Z FUSLG
0.00	.44	.84	1.21	1.51	1.75	1.93	2.06	2.15	2.19	Y FUSLG
2.19	2.15	2.06	1.93	1.75	1.51	1.21	.84	.44	-.00	Y FUSLG
3.14	3.08	2.93	2.70	2.41	2.08	1.73	1.36	1.01	.65	Z FUSLG
.29	-.07	-.44	-.79	-1.14	-1.47	-1.76	-1.99	-2.14	-2.19	Z FUSLG
0.00	.41	.81	1.16	1.45	1.70	1.88	2.02	2.11	2.15	Y FUSLG
2.15	2.11	2.02	1.88	1.70	1.45	1.16	.81	.41	-.00	Y FUSLG
2.90	2.85	2.72	2.51	2.24	1.93	1.60	1.26	.91	.55	Z FUSLG
.19	-.16	-.51	-.86	-1.19	-1.50	-1.76	-1.97	-2.11	-2.16	Z FUSLG
0.00	.38	.74	1.07	1.35	1.60	1.79	1.93	2.03	2.07	Y FUSLG
2.07	2.03	1.93	1.79	1.60	1.35	1.07	.74	.38	-.00	Y FUSLG
2.47	2.43	2.32	2.15	1.92	1.65	1.34	1.02	.69	.35	Z FUSLG
.00	-.34	-.67	-.99	-1.29	-1.56	-1.79	-1.97	-2.08	-2.12	Z FUSLG
0.00	.30	.59	.88	1.14	1.37	1.57	1.73	1.84	1.89	Y FUSLG
1.89	1.84	1.73	1.57	1.37	1.14	.88	.59	.30	-.00	Y FUSLG
1.69	1.66	1.59	1.48	1.32	1.13	.89	.62	.33	.02	Z FUSLG
-.29	-.60	-.90	-1.16	-1.40	-1.60	-1.76	-1.87	-1.94	-1.96	Z FUSLG
0.00	.25	.49	.71	.92	1.09	1.24	1.35	1.43	1.47	Y FUSLG
1.47	1.43	1.35	1.24	1.09	.92	.71	.49	.25	-.00	Y FUSLG
1.45	1.43	1.36	1.26	1.12	.95	.75	.53	.30	.06	Z FUSLG
-.18	-.42	-.65	-.87	-1.07	-1.24	-1.38	-1.48	-1.55	-1.57	Z FUSLG
0.00	.20	.38	.55	.69	.81	.90	.97	1.01	1.04	Y FUSLG
1.04	1.01	.97	.90	.81	.69	.55	.38	.20	-.00	Y FUSLG
1.22	1.19	1.13	1.03	.91	.77	.61	.45	.28	.11	Z FUSLG
-.07	-.24	-.41	-.57	-.73	-.87	-1.00	-1.09	-1.15	-1.18	Z FUSLG
0.00	.14	.27	.37	.46	.52	.57	.60	.62	.63	Y FUSLG
.63	.62	.60	.57	.52	.46	.37	.27	.14	-.00	Y FUSLG
.86	.84	.78	.69	.59	.48	.37	.26	.16	.05	Z FUSLG
-.05	-.16	-.26	-.37	-.48	-.59	-.69	-.78	-.84	-.86	Z FUSLG
0.00	.06	.07	.07	.08	.08	.08	.08	.08	.08	Y FUSLG
.08	.08	.08	.08	.08	.08	.07	.07	.06	-.00	Y FUSLG
.55	.41	.28	.22	.18	.15	.13	.11	.10	.08	Z FUSLG
.07	.06	.04	.03	.01	-.02	-.06	-.13	-.25	-.39	Z FUSLG
23.21	0.00	0.00	4.47	25.06	0.00	5.02	1.88			FIN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	FIN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	FIN DIMS
19.76	0.00	1.27	3.91	23.67	0.00	1.25	.39			SUB FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	SUB FIN
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	SUB FIN
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			TAIL FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	TAIL FIN
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	TAIL FIN
21.64	0.00	.78	5.02	22.96	6.59	.78	2.51			CAN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	CAN DIMS

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```
    0.00    1.89    3.56    4.68    5.34    5.74    6.00    5.29    3.66     .13  CAN DIMS
X Z OUT-45.030.00-20.0                                  8.0 ORT                    0
        8.0  2.0  4.0                                   5.00VU3                    1
```

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Input to D2290 for the Complete Boeing-737 Configuration. (see figures 2a and 2b)

```
      BOEING 737
 1 -1  1  1  1  1  0  3 10  1 20 14 20  0 20  0 20  0  1  4  3 10  1 10
1329.9                                                                     REF AREA
  0.00   1.25   5.00  10.00  15.00  20.00  30.00  50.00  70.00 100.00   WING %CH
 28.30   0.00  -1.40  23.80                                              WING DIM
 39.91  15.80  -1.40  12.40                                              WING DIM
 56.98  46.90    .77   4.80                                              WING DIM
  0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
  0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
  0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13   WNG THIC
  0.00   1.38   4.83   6.90   8.97  13.80  27.60  55.20  65.60  69.00   X FUSLG
 75.90  82.80  89.70  90.40
  0.00    .08    .16    .22    .26    .29    .31    .33    .34    .34   Y FUSLG
   .34    .34    .33    .31    .29    .26    .22    .16    .08   -.00   Y FUSLG
   .69    .67    .63    .57    .50    .44    .37    .31    .25    .20   Z FUSLG
   .14    .09    .03   -.03   -.10   -.16   -.23   -.29   -.33   -.35   Z FUSLG
  0.00    .31    .59    .82   1.01   1.15   1.25   1.31   1.36   1.38   Y FUSLG
  1.38   1.36   1.31   1.25   1.15   1.01    .82    .59    .31   -.00   Y FUSLG
  2.07   2.02   1.89   1.69   1.47   1.23    .98    .75    .51    .28   Z FUSLG
   .06   -.17   -.41   -.64   -.89  -1.13  -1.35  -1.55  -1.68  -1.73   Z FUSLG
  0.00    .56   1.09   1.55   1.92   2.22   2.45   2.60   2.71   2.75   Y FUSLG
  2.75   2.71   2.60   2.45   2.22   1.92   1.55   1.09    .56   -.00   Y FUSLG
  3.45   3.38   3.17   2.86   2.47   2.05   1.60   1.14    .69    .23   Z FUSLG
  -.23   -.69  -1.14  -1.60  -2.05  -2.47  -2.86  -3.17  -3.38  -3.45   Z FUSLG
  0.00    .67   1.30   1.86   2.34   2.72   3.02   3.24   3.37   3.44   Y FUSLG
  3.44   3.37   3.24   3.02   2.72   2.34   1.86   1.30    .67   -.00   Y FUSLG
  4.38   4.30   4.08   3.73   3.30   2.80   2.26   1.71   1.14    .58   Z FUSLG
   .00   -.56  -1.13  -1.68  -2.22  -2.72  -3.15  -3.50  -3.72  -3.80   Z FUSLG
  0.00    .82   1.59   2.27   2.84   3.29   3.64   3.89   4.05   4.13   Y FUSLG
  4.13   4.05   3.89   3.64   3.29   2.84   2.27   1.59    .82   -.00   Y FUSLG
  5.87   5.77   5.49   5.05   4.51   3.90   3.24   2.57   1.89   1.21   Z FUSLG
   .52   -.16   -.84  -1.51  -2.17  -2.78  -3.32  -3.76  -4.04  -4.14   Z FUSLG
  0.00    .93   1.83   2.65   3.37   3.97   4.45   4.81   5.05   5.17   Y FUSLG
  5.17   5.05   4.81   4.45   3.97   3.37   2.65   1.83    .93   -.00   Y FUSLG
  6.90   6.81   6.53   6.10   5.53   4.86   4.11   3.32   2.48   1.63   Z FUSLG
   .78   -.07   -.91  -1.70  -2.45  -3.12  -3.69  -4.12  -4.40  -4.49   Z FUSLG
  0.00   1.08   2.12   3.08   3.94   4.68   5.28   5.73   6.04   6.19   Y FUSLG
  6.19   6.04   5.73   5.28   4.68   3.94   3.08   2.12   1.08   -.00   Y FUSLG
  8.28   8.18   7.89   7.42   6.79   6.03   5.17   4.24   3.25   2.24   Z FUSLG
  1.21    .20   -.79  -1.72  -2.58  -3.34  -3.97  -4.44  -4.73  -4.83   Z FUSLG
  0.00   1.08   2.12   3.08   3.94   4.68   5.28   5.73   6.04   6.19   Y FUSLG
  6.19   6.04   5.73   5.28   4.68   3.94   3.08   2.12   1.08   -.00   Y FUSLG
  8.28   8.18   7.89   7.42   6.79   6.03   5.17   4.24   3.25   2.24   Z FUSLG
  1.21    .20   -.79  -1.72  -2.58  -3.34  -3.97  -4.44  -4.73  -4.83   Z FUSLG
  0.00    .97   1.90   2.79   3.60   4.32   4.91   5.37   5.69   5.85   Y FUSLG
  5.85   5.69   5.37   4.91   4.32   3.60   2.79   1.90    .97   -.00   Y FUSLG
  8.28   8.20   7.96   7.57   7.04   6.39   5.62   4.77   3.86   2.90   Z FUSLG
  1.93    .97    .06   -.79  -1.56  -2.21  -2.74  -3.13  -3.37  -3.45   Z FUSLG
  0.00    .91   1.79   2.63   3.39   4.06   4.62   5.06   5.35   5.50   Y FUSLG
```

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5.50	5.35	5.06	4.62	4.06	3.39	2.63	1.79	.91	-.00	Y FUSLG
8.28	8.20	7.98	7.61	7.12	6.50	5.78	4.98	4.12	3.22	Z FUSLG
2.30	1.40	.54	-.26	-.98	-1.60	-2.09	-2.46	-2.68	-2.76	Z FUSLG
0.00	.72	1.41	2.06	2.63	3.12	3.52	3.82	4.03	4.13	Y FUSLG
4.13	4.03	3.82	3.52	3.12	2.63	2.06	1.41	.72	-.00	Y FUSLG
7.94	7.87	7.68	7.36	6.94	6.44	5.87	5.24	4.58	3.91	Z FUSLG
3.22	2.55	1.89	1.26	.69	.19	-.23	-.55	-.74	-.81	Z FUSLG
0.00	.54	1.04	1.49	1.87	2.18	2.42	2.59	2.70	2.75	Y FUSLG
2.75	2.70	2.59	2.42	2.18	1.87	1.49	1.04	.54	-.00	Y FUSLG
7.59	7.53	7.35	7.07	6.72	6.32	5.89	5.45	5.00	4.54	Z FUSLG
4.09	3.63	3.18	2.74	2.31	1.91	1.56	1.28	1.10	1.04	Z FUSLG
0.00	.26	.44	.55	.61	.65	.67	.68	.69	.69	Y FUSLG
.69	.69	.68	.67	.65	.61	.55	.44	.26	-.00	Y FUSLG
7.50	7.38	7.11	6.84	6.60	6.41	6.26	6.12	5.99	5.88	Z FUSLG
5.76	5.65	5.52	5.38	5.23	5.04	4.80	4.53	4.26	4.14	Z FUSLG
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Y FUSLG
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Y FUSLG
6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	Z FUSLG
6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	6.56	Z FUSLG
34.0	15.0	-2.9								JET ORIG
0.0	7.9	15.8	[illegible]							JET DATA
1.6	2.0	2.0	1.4							JET DATA
71.10	0.00	7.60	15.90	91.80	0.00	35.20	4.80			FIN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	FIN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	FIN DIMS
66.20	0.00	8.28	9.02	75.22	0.00	13.10	.90			SUB FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	SUB FIN
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	SUB FIN
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			TAIL FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	TAIL FIN
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	TAIL FIN
76.60	0.00	6.20	12.40	89.25	17.60	8.99	[illegible]			CAN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	CAN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	CAN DIMS

X Z OUT-45.030.00-20.0 8.0 ORT 0

8.0 2.0 4.0 5.00VU3 1

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Input to D2290 for the Complete Mohawk Configuration. (see figures 2a and 2b)

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    MOHAWK - 2 PROPELLERS, TAIL WITH VERTICAL SECTIONS
1 -1  1  1  1  1  0  3 10  1 20 20 20  0 20  0 20  0  1  4  3 10  1 10
330.0                                                                    REF AREA
 0.00   1.25   5.00  10.00  15.00  20.00  30.00  50.00  70.00 100.00  WING %CH
10.90   0.00  -1.30  11.10                                            WING DIM
13.14  21.00   1.09   5.50                                            WING DIM
13.14  21.00   1.09   5.50                                            WING DIM
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00    .42    .85   1.70   2.55   3.40   4.25   5.10   5.95   6.80  X FUSLG
 7.65   8.50   9.35  10.20  12.75  25.50  29.75  34.00  39.95  40.80  X FUSLG
 0.00    .04    .07    .11    .13    .16    .17    .19    .20    .20  Y FUSLG
  .20    .20    .19    .17    .16    .13    .11    .07    .04   -.00  Y FUSLG
-2.15  -2.15  -2.17  -2.19  -2.21  -2.24  -2.27  -2.30  -2.34  -2.37  Z FUSLG
-2.40  -2.43  -2.47  -2.50  -2.53  -2.56  -2.58  -2.60  -2.62  -2.62  Z FUSLG
 0.00    .14    .29    .44    .59    .75    .89   1.03   1.13   1.19  Y FUSLG
 1.19   1.13   1.03    .89    .75    .59    .44    .29    .14   -.00  Y FUSLG
-1.35  -1.36  -1.38  -1.41  -1.46  -1.54  -1.64  -1.77  -1.94  -2.13  Z FUSLG
-2.32  -2.51  -2.68  -2.81  -2.91  -2.99  -3.04  -3.07  -3.09  -3.10  Z FUSLG
 0.00    .22    .44    .66    .87   1.09   1.29   1.47   1.60   1.67  Y FUSLG
 1.67   1.60   1.47   1.29   1.09    .87    .66    .44    .22   -.00  Y FUSLG
 -.74   -.75   -.78   -.84   -.93  -1.05  -1.21  -1.41  -1.65  -1.92  Z FUSLG
-2.19  -2.46  -2.70  -2.90  -3.06  -3.18  -3.27  -3.33  -3.36  -3.37  Z FUSLG
 0.00    .30    .59    .89   1.19   1.49   1.77   2.02   2.20   2.31  Y FUSLG
 2.31   2.20   2.02   1.77   1.49   1.19    .89    .59    .30   -.00  Y FUSLG
 -.13   -.14   -.19   -.27   -.38   -.55   -.76  -1.03  -1.36  -1.72  Z FUSLG
-2.11  -2.47  -2.80  -3.07  -3.28  -3.45  -3.56  -3.64  -3.69  -3.70  Z FUSLG
 0.00    .40    .79   1.17   1.53   1.86   2.14   2.37   2.54   2.62  Y FUSLG
 2.62   2.54   2.37   2.14   1.86   1.53   1.17    .79    .40   -.00  Y FUSLG
  .87    .84    .76    .62    .42    .16   -.15   -.51   -.91  -1.33  Z FUSLG
-1.77  -2.19  -2.59  -2.95  -3.26  -3.52  -3.72  -3.86  -3.94  -3.97  Z FUSLG
 0.00    .48    .94   1.37   1.74   2.05   2.31   2.50   2.62   2.68  Y FUSLG
 2.68   2.62   2.50   2.31   2.05   1.74   1.37    .94    .48   -.00  Y FUSLG
 1.75   1.70   1.56   1.34   1.05    .71    .33   -.09   -.52   -.96  Z FUSLG
-1.40  -1.84  -2.27  -2.69  -3.07  -3.41  -3.70  -3.92  -4.06  -4.11  Z FUSLG
 0.00    .51   1.01   1.48   1.91   2.29   2.61   2.86   3.03   3.12  Y FUSLG
 3.12   3.03   2.86   2.61   2.29   1.91   1.48   1.01    .51   -.00  Y FUSLG
 1.95   1.91   1.79   1.58   1.31    .96    .56    .11   -.38   -.89  Z FUSLG
-1.40  -1.91  -2.40  -2.85  -3.25  -3.60  -3.87  -4.08  -4.20  -4.24  Z FUSLG
 0.00    .53   1.04   1.53   1.99   2.39   2.74   3.01   3.19   3.29  Y FUSLG
 3.29   3.19   3.01   2.74   2.39   1.99   1.53   1.04    .53   -.00  Y FUSLG
 2.09   2.05   1.93   1.72   1.44   1.09    .68    .21   -.30   -.84  Z FUSLG
-1.38  -1.92  -2.43  -2.90  -3.31  -3.66  -3.94  -4.15  -4.27  -4.31  Z FUSLG
 0.00    .53   1.05   1.54   1.99   2.40   2.74   3.01   3.19   3.29  Y FUSLG
 3.29   3.19   3.01   2.74   2.40   1.99   1.54   1.05    .53   -.00  Y FUSLG
 2.11   2.07   1.94   1.74   1.46   1.11    .69    .22   -.29   -.83  Z FUSLG
-1.37  -1.91  -2.42  -2.89  -3.31  -3.66  -3.94  -4.14  -4.27  -4.31  Z FUSLG
 0.00    .53   1.04   1.51   1.94   2.31   2.62   2.85   3.01   3.09  Y FUSLG
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3.09	3.01	2.85	2.62	2.31	1.94	1.51	1.04	.53	-.00	Y FUSLG
2.09	2.04	1.91	1.68	1.38	1.02	.60	.14	-.35	-.85	Z FUSLG
-1.37	-1.87	-2.36	-2.82	-3.24	-3.60	-3.90	-4.13	-4.26	-4.31	Z FUSLG
0.00	.51	1.01	1.46	1.87	2.21	2.48	2.69	2.82	2.89	Y FUSLG
2.89	2.82	2.69	2.48	2.21	1.87	1.46	1.01	.51	-.00	Y FUSLG
2.02	1.97	1.83	1.59	1.29	.92	.51	.07	-.40	-.87	Z FUSLG
-1.35	-1.82	-2.29	-2.73	-3.14	-3.51	-3.81	-4.05	-4.19	-4.24	Z FUSLG
0.00	.50	.96	1.38	1.73	2.02	2.24	2.40	2.50	2.55	Y FUSLG
2.55	2.50	2.40	2.24	2.02	1.73	1.38	.96	.50	-.00	Y FUSLG
1.82	1.76	1.60	1.34	1.02	.65	.25	-.16	-.58	-1.00	Z FUSLG
-1.42	-1.84	-2.26	-2.67	-3.07	-3.44	-3.76	-4.02	-4.18	-4.24	Z FUSLG
0.00	.47	.90	1.29	1.61	1.87	2.06	2.20	2.29	2.33	Y FUSLG
2.33	2.29	2.20	2.06	1.87	1.61	1.29	.90	.47	-.00	Y FUSLG
1.55	1.49	1.33	1.08	.77	.42	.05	-.33	-.71	-1.10	Z FUSLG
-1.49	-1.88	-2.26	-2.64	-3.01	-3.36	-3.67	-3.92	-4.08	-4.14	Z FUSLG
0.00	.45	.88	1.26	1.58	1.83	2.03	2.18	2.27	2.31	Y FUSLG
2.31	2.27	2.18	2.03	1.83	1.58	1.26	.88	.45	-.00	Y FUSLG
1.41	1.36	1.21	.97	.68	.34	-.02	-.40	-.78	-1.16	Z FUSLG
-1.54	-1.92	-2.30	-2.68	-3.04	-3.38	-3.67	-3.91	-4.06	-4.11	Z FUSLG
0.00	.43	.84	1.21	1.51	1.76	1.95	2.08	2.17	2.21	Y FUSLG
2.21	2.17	2.08	1.95	1.76	1.51	1.21	.84	.43	-.00	Y FUSLG
1.41	1.36	1.21	.98	.70	.37	.03	-.33	-.70	-1.06	Z FUSLG
-1.43	-1.79	-2.16	-2.52	-2.86	-3.19	-3.47	-3.70	-3.85	-3.90	Z FUSLG
0.00	.33	.63	.91	1.15	1.34	1.50	1.61	1.68	1.72	Y FUSLG
1.72	1.68	1.61	1.50	1.34	1.15	.91	.63	.33	-.00	Y FUSLG
1.41	1.37	1.27	1.11	.90	.66	.40	.13	-.15	-.43	Z FUSLG
-.72	-1.00	-1.28	-1.55	-1.81	-2.05	-2.26	-2.42	-2.52	-2.56	Z FUSLG
0.00	.27	.53	.76	.97	1.14	1.28	1.38	1.44	1.48	Y FUSLG
1.48	1.44	1.38	1.28	1.14	.97	.76	.53	.27	-.00	Y FUSLG
1.35	1.32	1.24	1.11	.95	.75	.53	.30	.07	-.18	Z FUSLG
-.42	-.67	-.90	-1.13	-1.35	-1.55	-1.71	-1.84	-1.92	-1.95	Z FUSLG
0.00	.21	.41	.59	.74	.87	.97	1.04	1.08	1.11	Y FUSLG
1.11	1.08	1.04	.97	.87	.74	.59	.41	.21	-.00	Y FUSLG
1.28	1.26	1.19	1.09	.95	.80	.63	.46	.27	.09	Z FUSLG
-.09	-.27	-.46	-.63	-.80	-.95	-1.09	-1.19	-1.26	-1.28	Z FUSLG
0.00	.09	.17	.24	.29	.32	.34	.36	.37	.37	Y FUSLG
.37	.37	.36	.34	.32	.29	.24	.17	.09	-.00	Y FUSLG
1.28	1.26	1.21	1.15	1.07	1.00	.93	.86	.80	.74	Z FUSLG
.67	.61	.55	.48	.41	.34	.26	.20	.15	.13	Z FUSLG
0.00	.02	.03	.05	.07	.09	.10	.12	.13	.14	Y FUSLG
.14	.13	.12	.10	.09	.07	.05	.03	.02	-.00	Y FUSLG
.94	.94	.94	.93	.93	.92	.91	.89	.87	.85	Z FUSLG
.83	.81	.79	.77	.76	.75	.75	.74	.74	.74	Z FUSLG
8.5	9.0	1.3								PROP POD
0.0	4.3	8.6	12.9							PROP DAT
1.5	1.5	1.5	1.3							PROP DAT
35.30	0.00	1.30	5.40	36.77	0.00	8.40	3.00			FIN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	FIN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	FIN DIMS
29.80	0.00	1.35	5.79	35.59	0.00	2.70	.58			SUB FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	SUB FIN
2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	SUB FIN

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35.87	6.80	2.66	3.80	37.20	6.35	7.76	1.70			TAIL FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	TAIL FIN
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	TAIL FIN
33.20	0.00	1.70	7.70	35.87	6.80	2.66	3.80			CAN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	CAN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	CAN DIMS

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X Z OUT-45.030.00-20.0                       8.0 ORT                0
        8.0  2.0  4.0                        5.00VU3                1
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Input to D2290 for the Complete ASW-20 Configuration. (see figures 4a and 4b)

```
     ASW-20 SAILPLANE
1 -1  1  0  1  1  0  3 10  1 20 20 20  0 20  0 20  0  1  4  2 10  1 10
113.0                                                                  REF AREA
 0.00   1.25   5.00  10.00  15.00  20.00  30.00  50.00  70.00 100.00  WING %CH
 7.24   0.00    .96   2.90                                            WING DIM
 7.40  15.58   1.77   2.25                                            WING DIM
 7.65  24.67   2.25   1.25                                            WING DIM
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00   1.89   3.56   4.68   5.34   5.74   6.00   5.29   3.66    .13  WNG THIC
 0.00    .64   1.38   2.08   2.79   3.46   4.15   4.90   5.53   6.28  X FUSLG
 6.92   7.66   8.41   9.79  11.17  11.92  12.56  13.99  14.68  22.40  X FUSLG
 0.00    .01    .02    .03    .03    .04    .04    .05    .05    .05  Y FUSLG
  .05    .05    .05    .04    .04    .03    .03    .02    .01   -.00  Y FUSLG
  .09    .08    .08    .08    .07    .07    .06    .05    .05    .04  Z FUSLG
  .03    .02    .01    .00   -.00   -.01   -.01   -.02   -.02   -.02  Z FUSLG
 0.00    .06    .12    .17    .21    .24    .26    .28    .29    .29  Y FUSLG
  .29    .29    .28    .26    .24    .21    .17    .12    .06   -.00  Y FUSLG
  .48    .47    .44    .40    .35    .30    .25    .20    .15    .10  Z FUSLG
  .06    .01   -.04   -.09   -.14   -.19   -.24   -.28   -.31   -.32  Z FUSLG
 0.00    .11    .21    .30    .37    .43    .47    .50    .52    .53  Y FUSLG
  .53    .52    .50    .47    .43    .37    .30    .21    .11   -.00  Y FUSLG
  .80    .78    .74    .68    .61    .53    .44    .35    .27    .18  Z FUSLG
  .09    .00   -.09   -.18   -.26   -.34   -.42   -.48   -.52   -.53  Z FUSLG
 0.00    .15    .28    .40    .50    .58    .64    .68    .70    .72  Y FUSLG
  .72    .70    .68    .64    .58    .50    .40    .28    .15   -.00  Y FUSLG
 1.10   1.08   1.03    .95    .85    .74    .62    .50    .38    .26  Z FUSLG
  .15    .03   -.09   -.21   -.33   -.44   -.54   -.62   -.67   -.69  Z FUSLG
 0.00    .17    .34    .47    .59    .67    .74    .78    .81    .82  Y FUSLG
  .82    .81    .78    .74    .67    .59    .47    .34    .17   -.00  Y FUSLG
 1.33   1.31   1.24   1.14   1.01    .88    .74    .60    .47    .33  Z FUSLG
  .19    .06   -.08   -.22   -.36   -.49   -.61   -.72   -.78   -.81  Z FUSLG
 0.00    .20    .38    .54    .67    .76    .83    .88    .91    .93  Y FUSLG
  .93    .91    .88    .83    .76    .67    .54    .38    .20   -.00  Y FUSLG
 1.54   1.51   1.43   1.32   1.17   1.02    .86    .71    .55    .40  Z FUSLG
  .24    .09   -.07   -.23   -.38   -.54   -.68   -.80   -.88   -.90  Z FUSLG
 0.00    .22    .42    .59    .72    .83    .90    .96    .99   1.01  Y FUSLG
 1.01    .99    .96    .90    .83    .72    .59    .42    .22   -.00  Y FUSLG
 1.70   1.67   1.58   1.46   1.30   1.13    .96    .79    .62    .46  Z FUSLG
  .29    .12   -.05   -.22   -.39   -.56   -.71   -.84   -.93   -.96  Z FUSLG
 0.00    .23    .44    .62    .76    .87    .95   1.01   1.05   1.06  Y FUSLG
 1.06   1.05   1.01    .95    .87    .76    .62    .44    .23   -.00  Y FUSLG
 1.81   1.77   1.68   1.54   1.38   1.20   1.02    .84    .66    .49  Z FUSLG
  .31    .13   -.04   -.22   -.41   -.58   -.75   -.88   -.98  -1.01  Z FUSLG
 0.00    .24    .45    .64    .78    .90    .98   1.03   1.07   1.09  Y FUSLG
 1.09   1.07   1.03    .98    .90    .78    .64    .45    .24   -.00  Y FUSLG
 1.88   1.85   1.75   1.61   1.44   1.26   1.08    .89    .71    .53  Z FUSLG
  .35    .17   -.02   -.20   -.39   -.57   -.74   -.88   -.98  -1.01  Z FUSLG
 0.00    .23    .45    .63    .78    .89    .98   1.03   1.07   1.09  Y FUSLG
```

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1.09	1.07	1.03	.98	.89	.78	.63	.45	.23	-.00	Y FUSLG
1.93	1.89	1.80	1.66	1.49	1.31	1.12	.94	.76	.57	Z FUSLG
.39	.21	.03	-.15	-.34	-.52	-.69	-.83	-.92	-.96	Z FUSLG
0.00	.22	.43	.61	.76	.87	.95	1.01	1.04	1.06	Y FUSLG
1.06	1.04	1.01	.95	.87	.76	.61	.43	.22	-.00	Y FUSLG
1.88	1.85	1.76	1.63	1.48	1.30	1.13	.95	.77	.59	Z FUSLG
.42	.24	.06	-.12	-.29	-.46	-.62	-.75	-.84	-.87	Z FUSLG
0.00	.21	.41	.57	.71	.81	.88	.93	.97	.98	Y FUSLG
.98	.97	.93	.88	.81	.71	.57	.41	.21	-.00	Y FUSLG
1.86	1.83	1.75	1.62	1.47	1.30	1.14	.97	.80	.64	Z FUSLG
.48	.31	.15	-.02	-.19	-.35	-.50	-.63	-.71	-.74	Z FUSLG
0.00	.19	.37	.53	.65	.74	.81	.86	.89	.90	Y FUSLG
.90	.89	.86	.81	.74	.65	.53	.37	.19	-.00	Y FUSLG
1.76	1.73	1.65	1.53	1.39	1.24	1.09	.93	.78	.63	Z FUSLG
.48	.33	.18	.03	-.12	-.27	-.41	-.53	-.61	-.64	Z FUSLG
0.00	.16	.32	.45	.55	.63	.69	.73	.76	.77	Y FUSLG
.77	.76	.73	.69	.63	.55	.45	.32	.16	-.00	Y FUSLG
1.54	1.52	1.45	1.36	1.24	1.11	.98	.85	.72	.60	Z FUSLG
.47	.34	.21	.08	-.05	-.18	-.29	-.39	-.46	-.48	Z FUSLG
0.00	.14	.26	.37	.46	.54	.59	.63	.65	.66	Y FUSLG
.66	.65	.63	.59	.54	.46	.37	.26	.14	-.00	Y FUSLG
1.32	1.30	1.25	1.18	1.09	.98	.88	.77	.66	.55	Z FUSLG
.44	.33	.22	.11	-.00	-.11	-.20	-.27	-.32	-.34	Z FUSLG
0.00	.12	.24	.34	.43	.50	.55	.59	.62	.63	Y FUSLG
.63	.62	.59	.55	.50	.43	.34	.24	.12	-.00	Y FUSLG
1.22	1.20	1.16	1.10	1.02	.93	.83	.73	.62	.52	Z FUSLG
.41	.31	.21	.10	.01	-.09	-.17	-.23	-.27	-.29	Z FUSLG
0.00	.11	.21	.31	.39	.46	.51	.56	.58	.59	Y FUSLG
.59	.58	.56	.51	.46	.39	.31	.21	.11	-.00	Y FUSLG
1.10	1.09	1.06	1.01	.94	.86	.77	.68	.58	.48	Z FUSLG
.38	.29	.19	.10	.01	-.07	-.14	-.19	-.22	-.23	Z FUSLG
0.00	.09	.18	.27	.34	.41	.47	.51	.54	.56	Y FUSLG
.56	.54	.51	.47	.41	.34	.27	.18	.09	-.00	Y FUSLG
.96	.95	.93	.89	.84	.78	.71	.62	.54	.44	Z FUSLG
.35	.26	.17	.09	.02	-.04	-.09	-.13	-.15	-.16	Z FUSLG
0.00	.09	.17	.25	.32	.39	.44	.48	.51	.53	Y FUSLG
.53	.51	.48	.44	.39	.32	.25	.17	.09	-.00	Y FUSLG
.88	.88	.86	.82	.77	.72	.65	.57	.49	.41	Z FUSLG
.32	.23	.15	.07	.01	-.05	-.10	-.13	-.15	-.16	Z FUSLG
0.00	.03	.06	.09	.11	.14	.16	.17	.18	.19	Y FUSLG
.19	.18	.17	.16	.14	.11	.09	.06	.03	-.00	Y FUSLG
.16	.16	.15	.14	.12	.10	.08	.05	.02	-.01	Z FUSLG
-.04	-.07	-.10	-.13	-.15	-.17	-.19	-.20	-.21	-.21	Z FUSLG
20.32	0.00	0.00	3.32	21.70	0.00	4.24	2.04			FIN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	FIN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	FIN DIMS
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			TAIL FIN
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	TAIL FIN
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	TAIL FIN
21.49	0.00	4.26	1.81	21.91	3.62	4.26	1.17			CAN DATA
0.00	1.25	5.00	10.00	15.00	20.00	30.00	50.00	70.00	100.00	CAN DIMS
0.00	1.89	3.56	4.68	5.34	5.74	6.00	5.29	3.66	.13	CAN DIMS

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```
X Z OUT-45.030.00-20.0                              8.0 ORT                 0
        8.0  2.0  4.0                               F.00VU3                 1
```

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APPENDIX IV - Procedure File Listing.

```
DATPLOT.                                         delivery information
USER,number.
CHARGE,number,LRC.
GET,DATPLTB,ABS2290/UN=760679C.
GET,TAPE4=filename.
ATTACH,XEDIT/UN=LIBRARY.
XEDIT,TAPE4,L=0.;B;I5;CASEID; $OPTINS$; $SYNTHS$; $BODY$; $WGPLNF$;END
XEDIT,TAPE4,L=0.;B;I4; $JETPWR$; $PROPWR$; $VTPLNF$; $HTPLNF$;END.
DATPLTB.
REWIND,TAPE7.
ABS2290,TAPE7.
PLOT.CALPOST,11(X0=1.0,Y0=1.0,FSH=8.5,FSV=11.)
CONT.//BLACK LEROY PEN .3//
EXIT.
REWIND,TAPE7.
COPY,TAPE7.
 --EOR--
YES (DEFAULTS ACCEPTED?  IF: NO, THEN CARDS SIMILAR TO THE FOLLOWING ARE NEEDED)
YES  (PLOT COMPLETE CONFIGURATION?)
ORT
X Z OUT-45.0-5.00+20.0                            8.0 ORT                0
VU3
         8.   2.0   5.0                          10.00VU3                1


 --EOR--
.PROC,PLOT.
REWIND,*.
IFE,FILE(DATPLTB,AS)=0,JUMP1.
GET,DATPLTB/UN=760679C.
ENDIF,JUMP1.
IFE,FILE(TAPE4,AS)=0,JUMP2.
GET,TAPE4=filename.
ENDIF,JUMP2.
ATTACH,XEDIT/UN=LIBRARY.
XEDIT,TAPE4,L=0.;B,I5;CASEID; $OPTINS$; $SYNTHS$; $BODY$; $WGPLNF$;END.
XEDIT,TAPE4,L=0.;B;I4; $JETPWR$; $PROPWR$; $VTPLNF$; $HTPLNF$;END.
DATPLTB.
REWIND,TAPE7.
IFE,FILE(ABS2290,AS)=0,JUMP3.
GET,ABS2290/UN=760679C.
ENDIF,JUMP3.
ASSIGN,MS,OUTPUT.
ABS2290,TAPE7.
ASSIGN,TT,OUTPUT.
PLOT.TEKPOST,TE,(X0=2.5).
REVERT.* PROC PLOT ENDED *
```

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```
EXIT.
ASSIGN,TT,OUTPUT.
REVERT.* DISCREPANCY IN INPUT *
```

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APPENDIX V - Sample Terminal Sessions

```
-plot,pdtplt
  PLOT WITH DEFAULT PARAMETERS? (Y/N)
? n
 PLOT COMPLETE CONFIGURATION? (Y/N)
? n
  TYPE THE PLOT TITLE:
? navion fuselage
  WING  :
    TYPE 0  IF  NO WING ,
         1  FOR WING ,
? 0
  FUSELAGE  :
    TYPE 0  IF  NO FUSELAGE ,
         1  FOR FUSELAGE,
? 1
  POD  :
    TYPE 0  IF  NO POD ,
         1  FOR PODS,
? 0
  HORIZONTAL TAIL, OR CANARD :
    TYPE 0  IF  NO HORIZONTAL TAIL, AND NO CANARD,
         1  FOR HORIZONTAL TAIL OR CANARD,
? 0
 DEFAULT VIEWS OF CONFIGURATION? (Y/N)
? y
 A PLOT VECTOR FILE IS NOW BEING CREATED.
       >>>   PLEASE STAND BY   <<<

 THE PLOT CONTROL STATEMENT IS,


 PLOT.TEKPOST,TE,(X0=2.5).
 INPUT TERMINAL TYPE
 1 - 4006-4013,4051
 2 - 4014-4015,4081
 3 - 4014-4015,4081 W/EGM
 4 - 4025

? 2

 ENTER BAUD RATE
? 1200
```

(see figures 5a and 5b)

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```
IT,TAPE4=ASU20
/-PLOT,PDTPLT
  PLOT WITH DEFAULT PARAMETERS? (Y/N)
? N
 PLOT COMPLETE CONFIGURATION? (Y/N)
? Y
 DEFAULT VIEWS OF CONFIGURATION? (Y/N)
? N
  TYPE  ORT FOR ORTHOGRAPHIC PLOTS,
        VV3     STACKED PLAN,FRONT AND SIDE VIEWS,
        PER     PERSPECTIVE VIEWS,
        STE     STEREO VIEWS.
? VV3
  TYPE Y-ORIGIN ON SCREEN, OF VIEW FROM TOP, (EXAMPLE:8.0)
? 8
  TYPE Y-ORIGIN ON SCREEN, OF SIDE VIEW (EXAMPLE:2.0)
? 4.5
  TYPE Y-ORIGIN ON SCREEN OF FRONT VIEW, (EXAMPLE:4.0)
? 2
  TYPE PLOTSIZE, (EXAMPLE:5.)
? 5
  ARE MORE PLOTS WANTED? (Y/N)
? N
 A PLOT VECTOR FILE IS NOW BEING CREATED.
       >>>   PLEASE STAND BY   <<<

 THE PLOT CONTROL STATEMENT IS,


 PLOT.TEKPOST,TE,(X0=2.5).
 INPUT TERMINAL TYPE
 1 - 4006-4013,4051
 2 - 4014-4015,4081
 3 - 4014-4015,4081 W/EGM
 4 - 4025

? 2

 ENTER BAUD RATE
? 1200
```

(see figure 6)

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```
GET,TAPE4-AGU20
/-PLOT,PSTPLT
  PLOT WITH DEFAULT PARAMETERS? (Y/N)
? N
 PLOT COMPLETE CONFIGURATION? (Y/N)
? N
  TYPE THE PLOT TITLE:
? AGU-20 UINGS & TAILS
  UING  :
    TYPE 0  IF  NO UING .
         1  FOR UING ,
? 1
  FUSELAGE  :
    TYPE 0  IF  NO FUSELAGE .
         1  FOR FUSELAGE,
? 0
  POD  :
    TYPE 0  IF  NO POD ,
         1  FOR PODS,
? 0
  UERTICAL TAIL AND FINS :
    TYPE 0  IF  NO UERTICAL TAIL, AND NO FIN ,
         1  FOR UERTICAL TAIL AND/OR FINS,
? 1
  HORIZONTAL TAIL, OR CANARD :
    TYPE 0  IF  NO HORIZONTAL TAIL, AND NO CANARD,
         1  FOR HORIZONTAL TAIL OR CANARD,
? 1
 DEFAULT UIEWS OF CONFIGURATION? (Y/N)
? N
  TYPE  ORT FOR ORTHOGRAPHIC PLOTS,
        UU3     STACKED PLAN,FRONT AND SIDE UIEWS,
        PER     PERSPECTIVE UIEWS,
        STE     STEREO UIEWS.
? UU3
  TYPE Y-ORIGIN ON SCREEN, OF UIEU FROM TOP, (EXAMPLE:8.0)
? 7
  TYPE Y-ORIGIN ON SCREEN, OF SIDE UIEU (EXAMPLE:2.0)
? 3.5
  TYPE Y-ORIGIN ON SCREEN OF FRONT UIEU, (EXAMPLE:4.0)
? 2
  TYPE PLOTSIZE, (EXAMPLE:5.)
? 4.5
  ARE MORE PLOTS UANTED? (Y/N)
? N
 A PLOT UECTOR FILE IS NOU BEING CREATED.
       >>>   PLEASE STAND BY   <<<

 THE PLOT CONTROL STATEMENT IS,


 PLOT,TEKPOST,TE,(X0-2.5).
 INPUT TERMINAL TYPE
 1 - 4006-4013,4051
 2 - 4014-4015,4081
 3 - 4014-4015,4081 U/EGM
 4 - 4025

? 2

 ENTER BAUD RATE
? 1200
```

(see figure 7)

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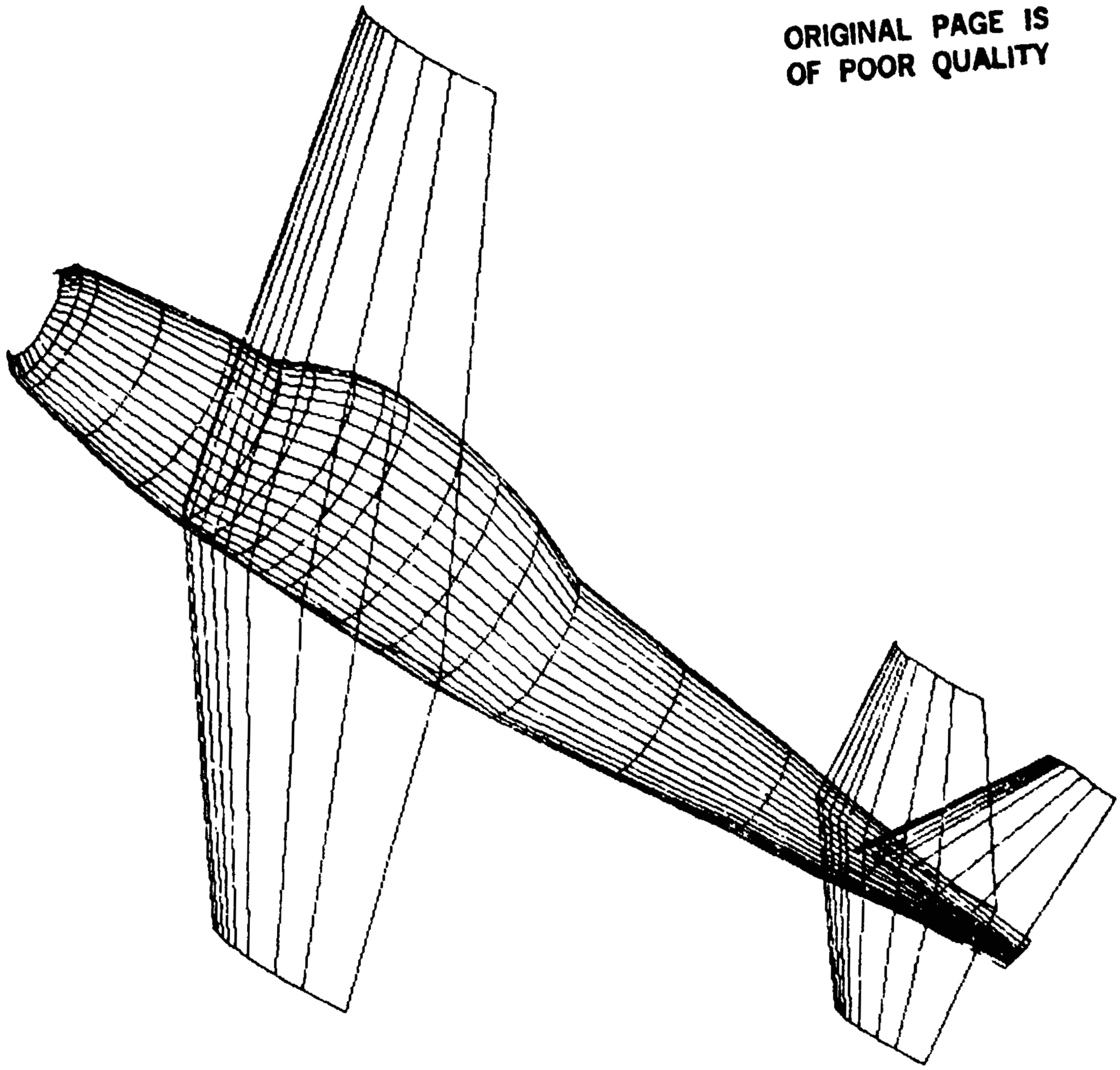

NAVION WITH ELEVATORS AND NO FLAPS OR AILERON DEFLECTIONS

X Z OUT-45.030.00-20.0 8.0 ORT 0

Figure 1a - Orthographic view of the Navion airplane

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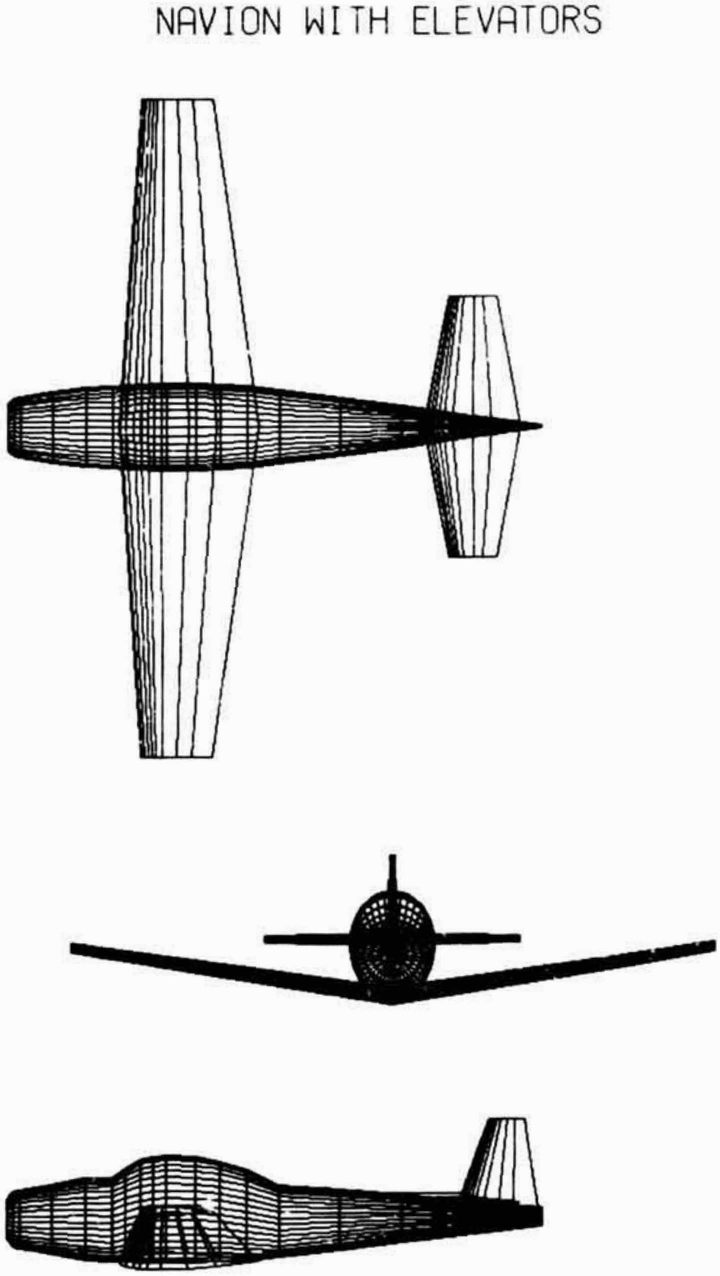

Figure 1b - 3-view projections of the Navion airplane

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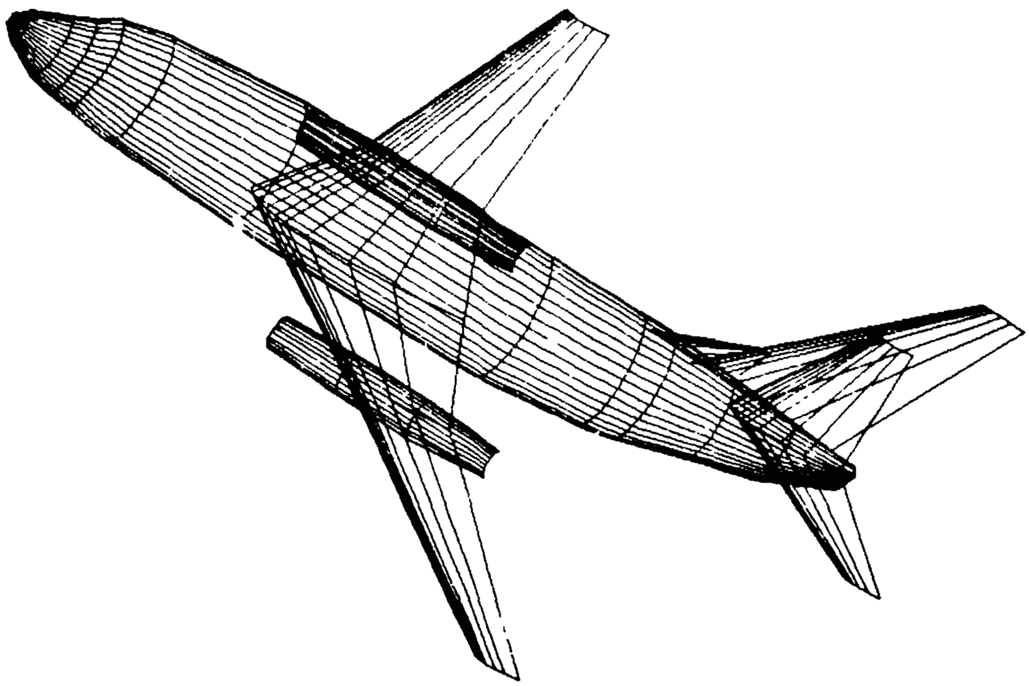

BOEING 737

X Z OUT-45.030.00-20.0 8.0 ORT 0

Figure 2a - Orthographic view of the Boeing-737 aircraft

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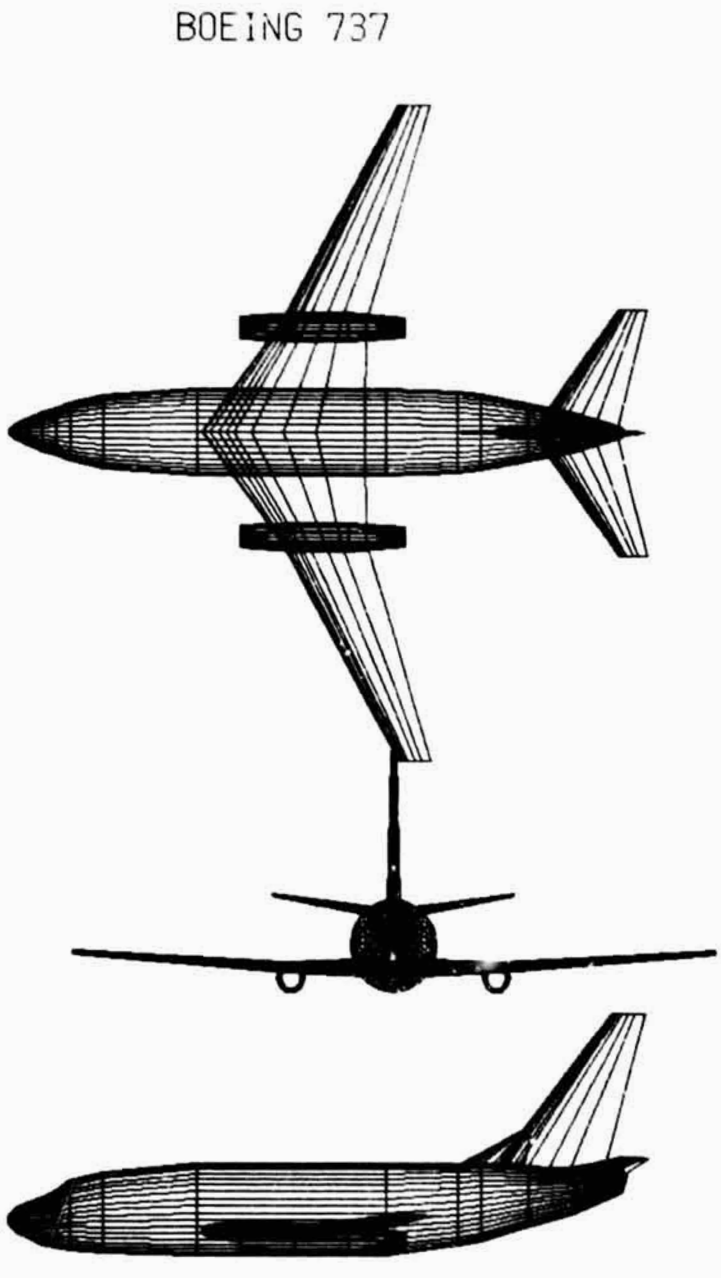

Figure 2b - 3-view projections of the Boeing-737 aircraft

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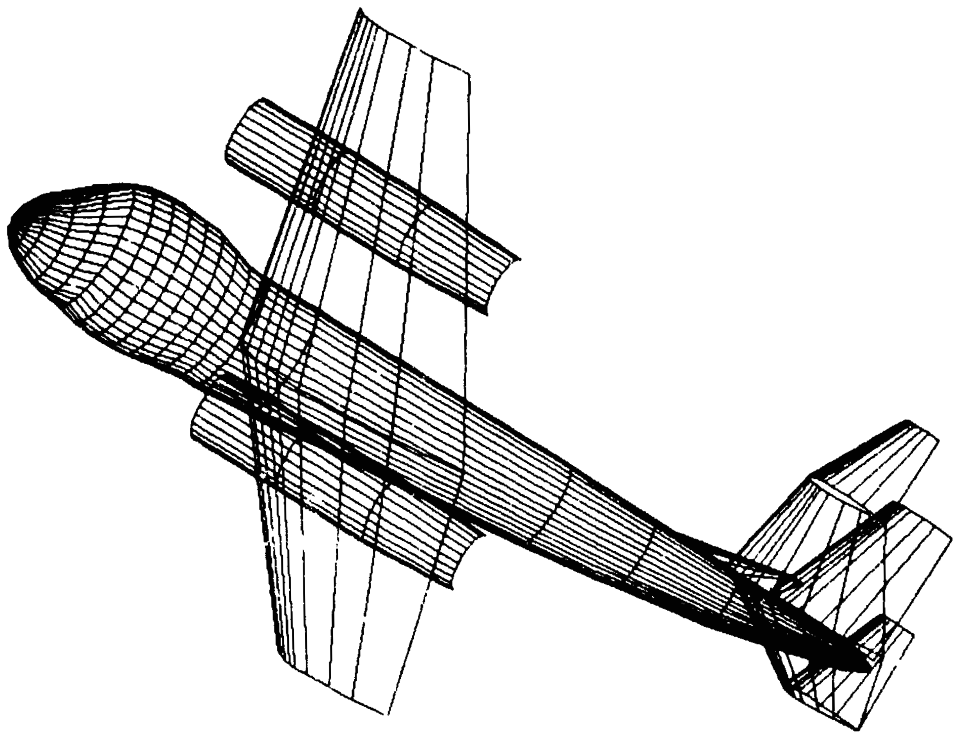

MOHAWK - 2 PROPELLERS. TAIL WITH VERTICAL SECTIONS

X Z OUT-45.030.00-20.0 8.0 ORT 0

Figure 3a - Orthographic view of the Mohawk airplane

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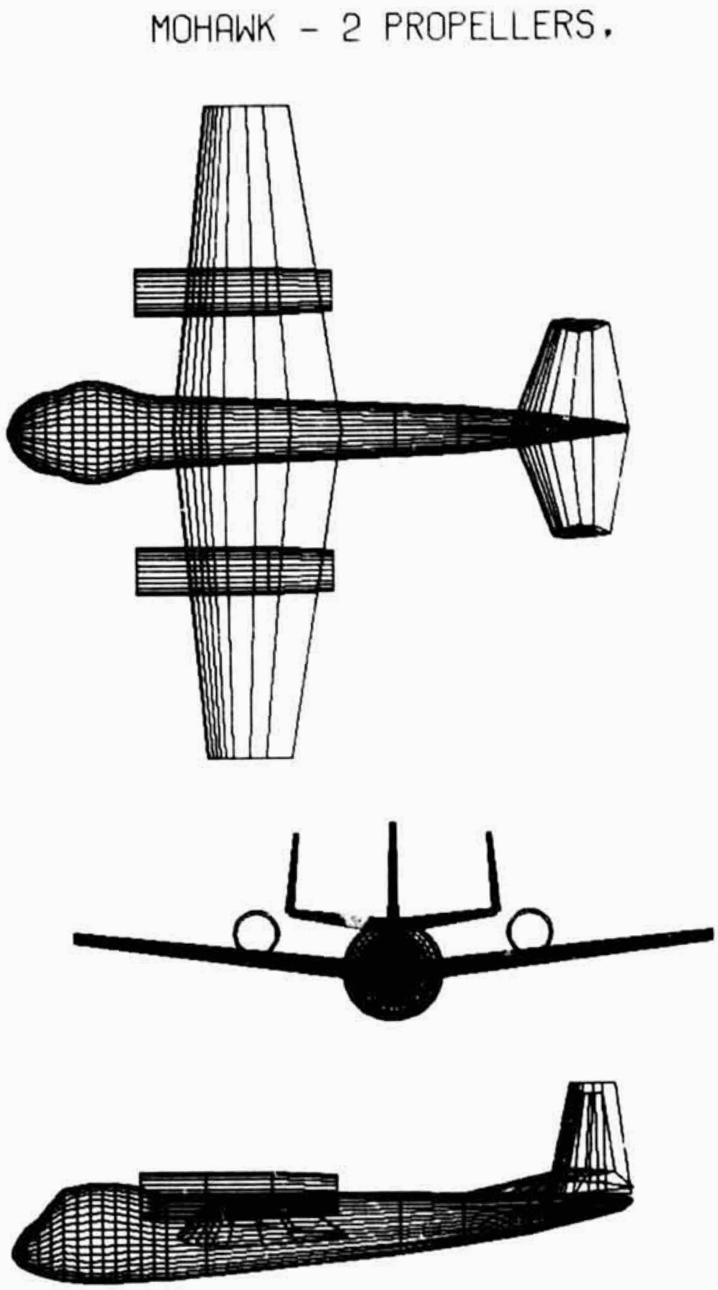

Figure 3b - 3-view projections of the Mohawk airplane

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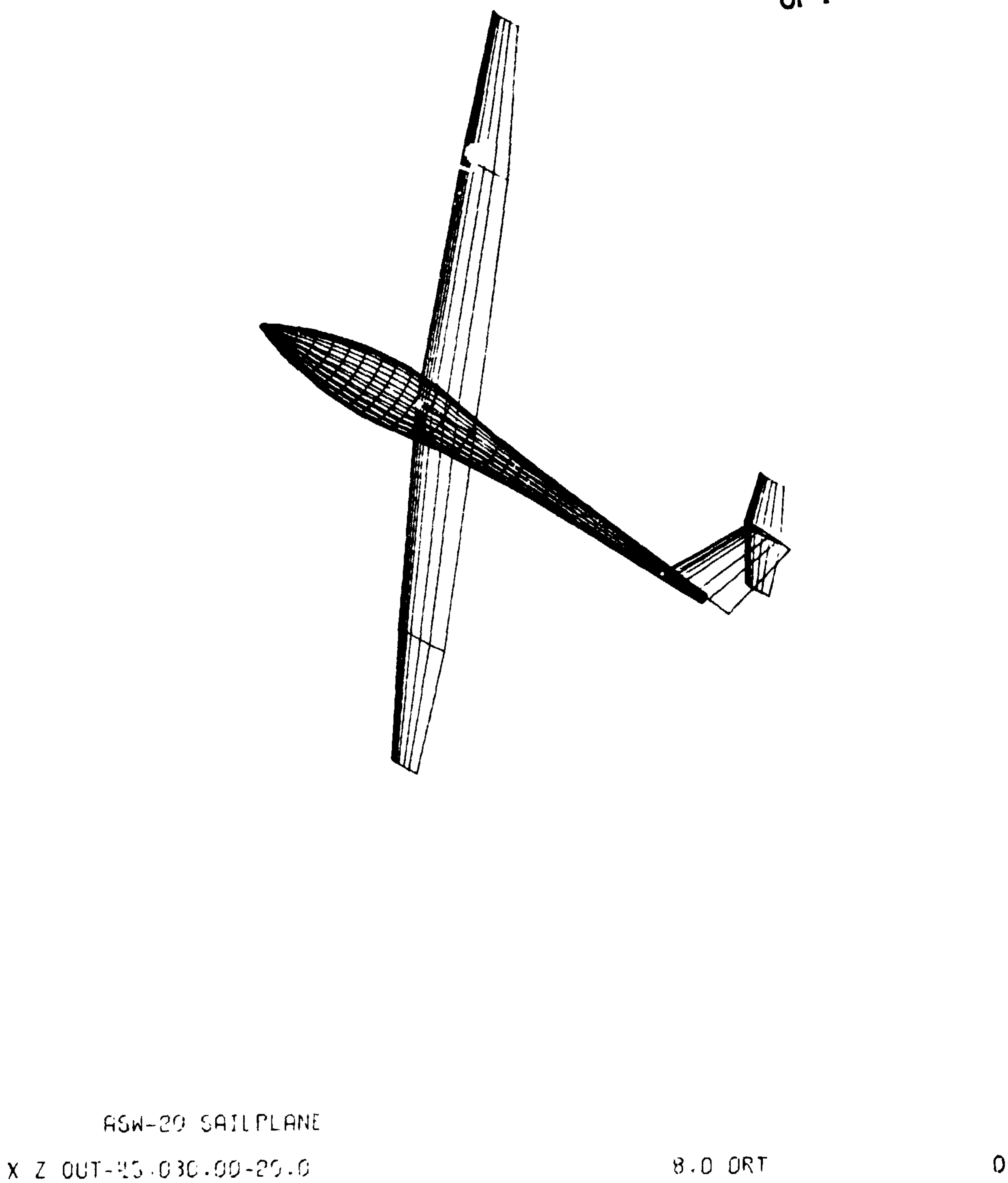

Figure 4a - Orthographic view of the ASW-20 sailplane

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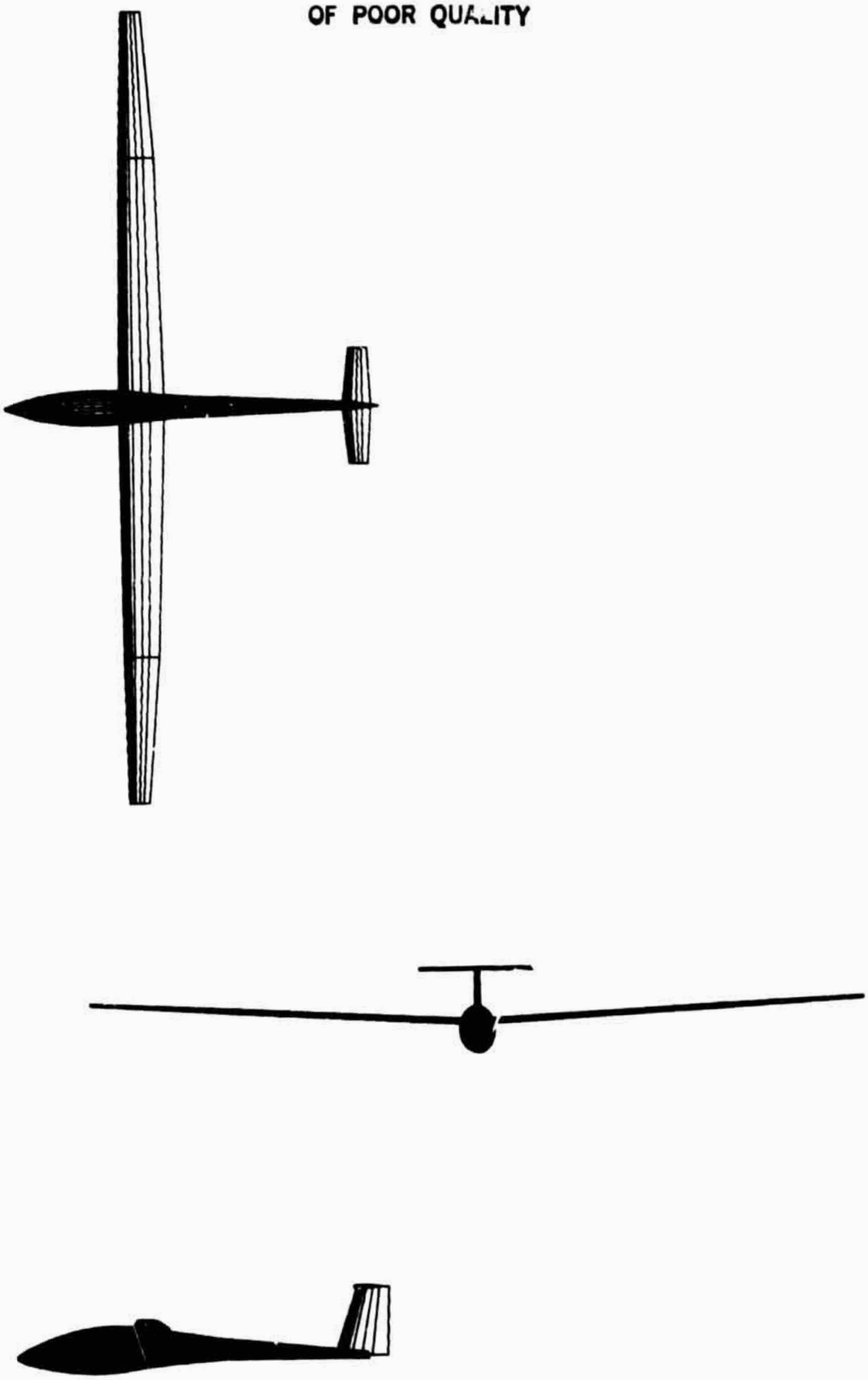

Figure 4b - 3-view projections of the ASW-20 sailplane

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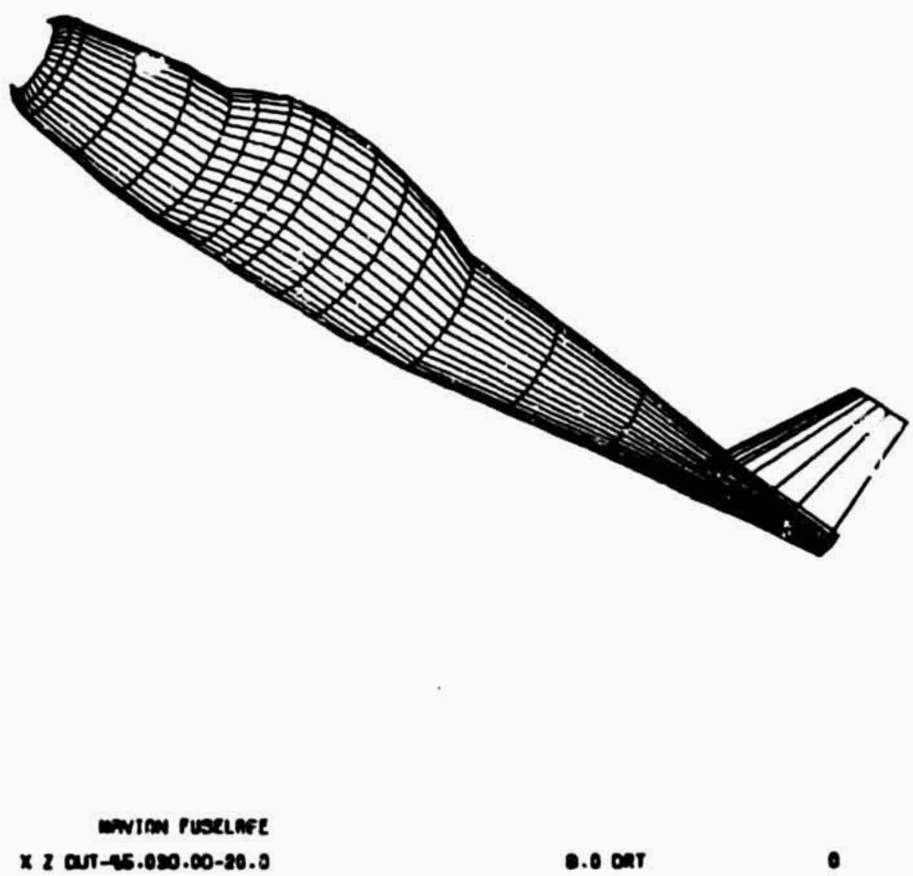

Figure 5a - Orthographic view of the Navion fuselage,
obtained at a Tektronix terminal.

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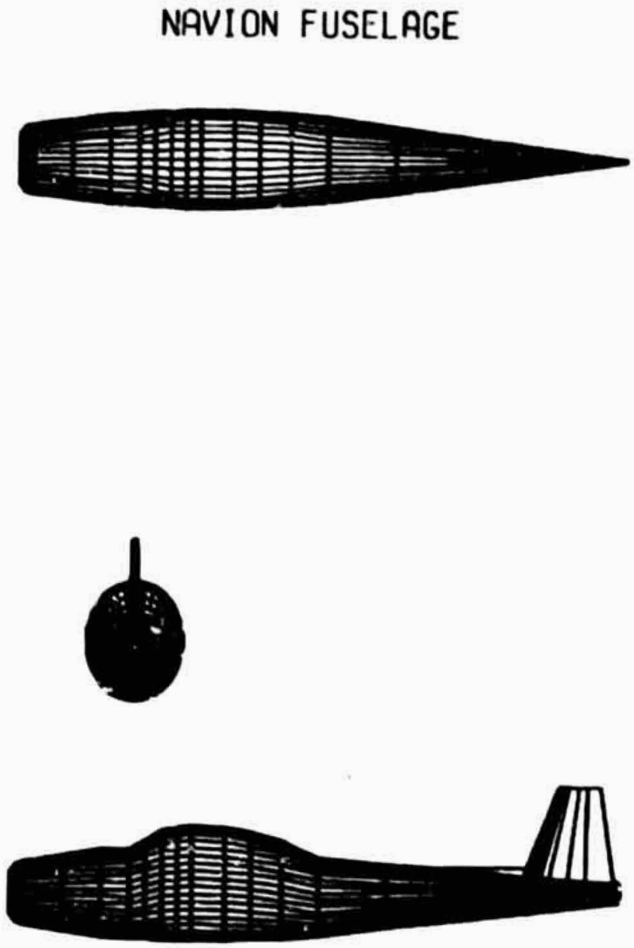

Figure 5b - 3-view projections of the Navion airplane, obtained at a Tektronix terminal.

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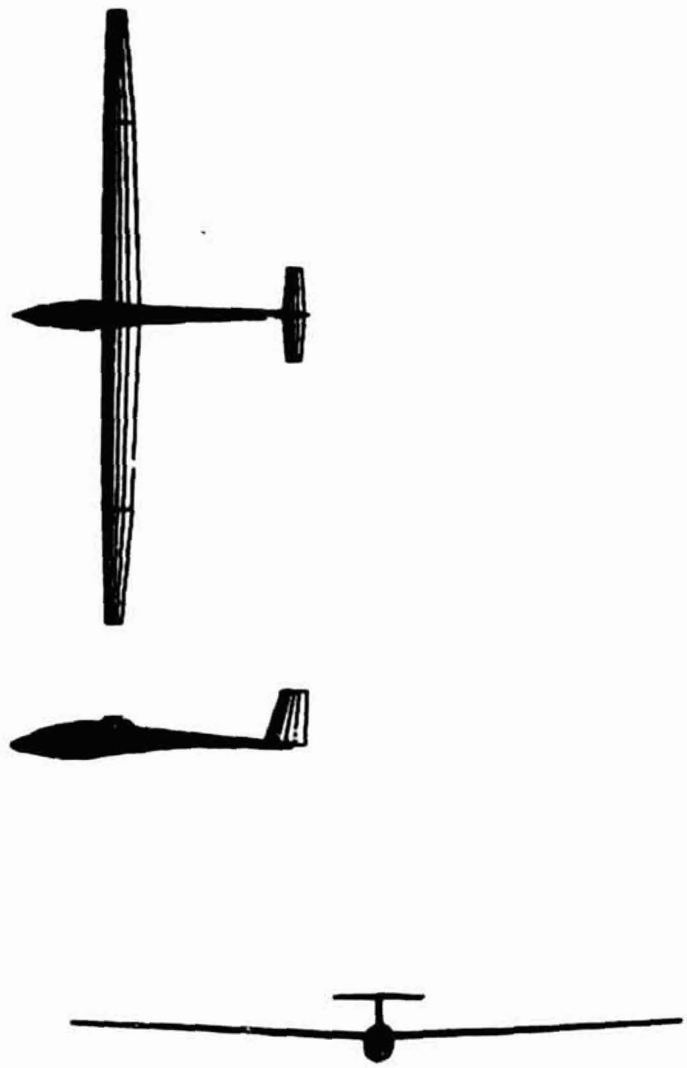

Figure 6 - 3-view projections of the ASW-20 sailplane, obtained at a Tektronix terminal.

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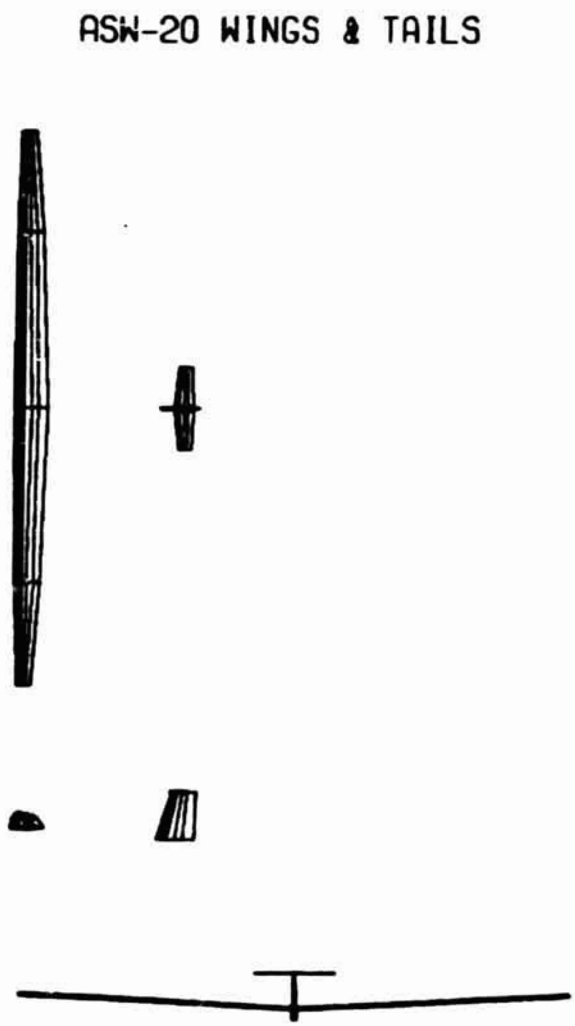

Figure 7 - 3-view projections of the ASW-20 wings and tails, obtained at a Tektronix terminal.

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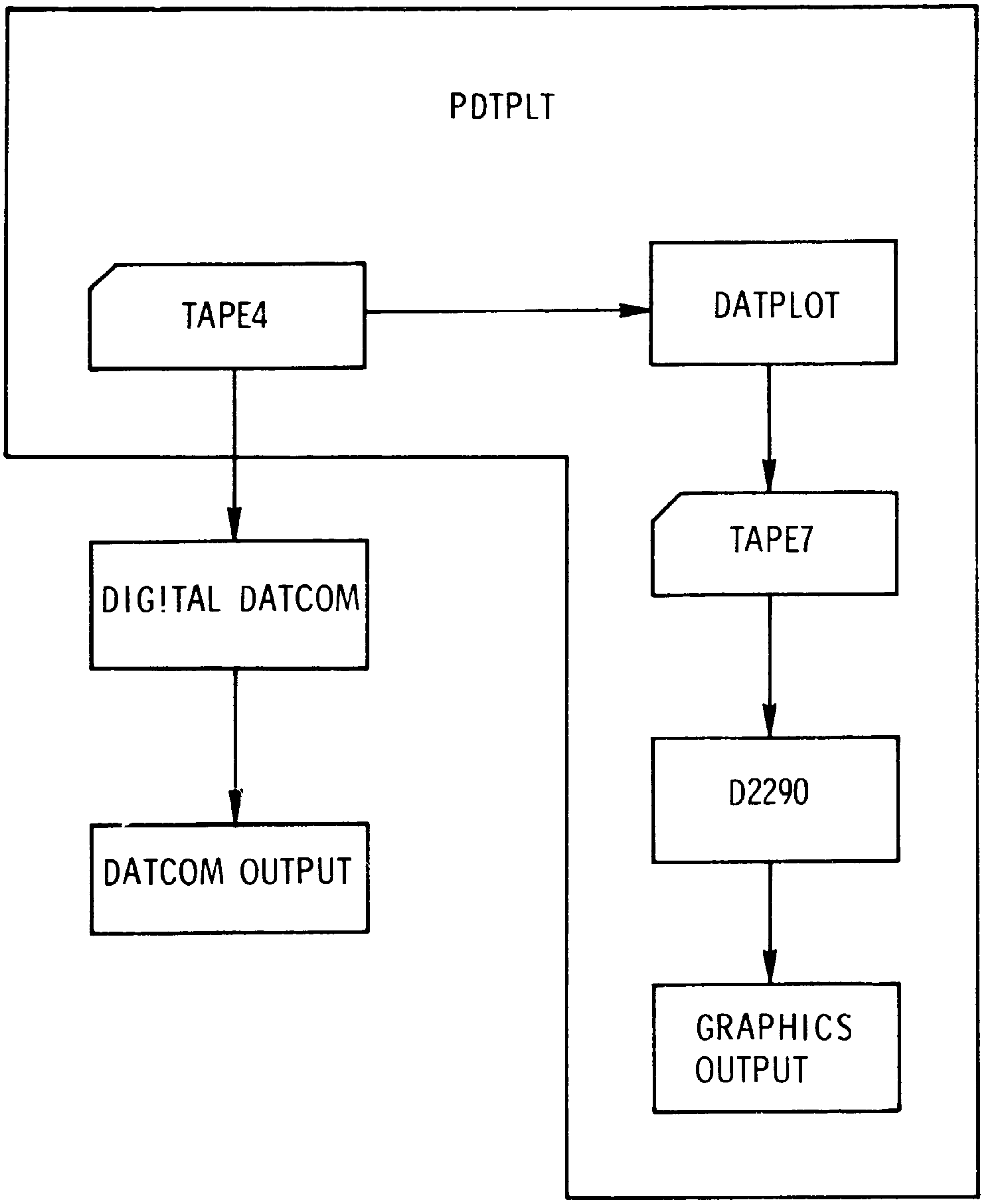

Figure 8 - Information flow chart of PDTPLT procedure file.

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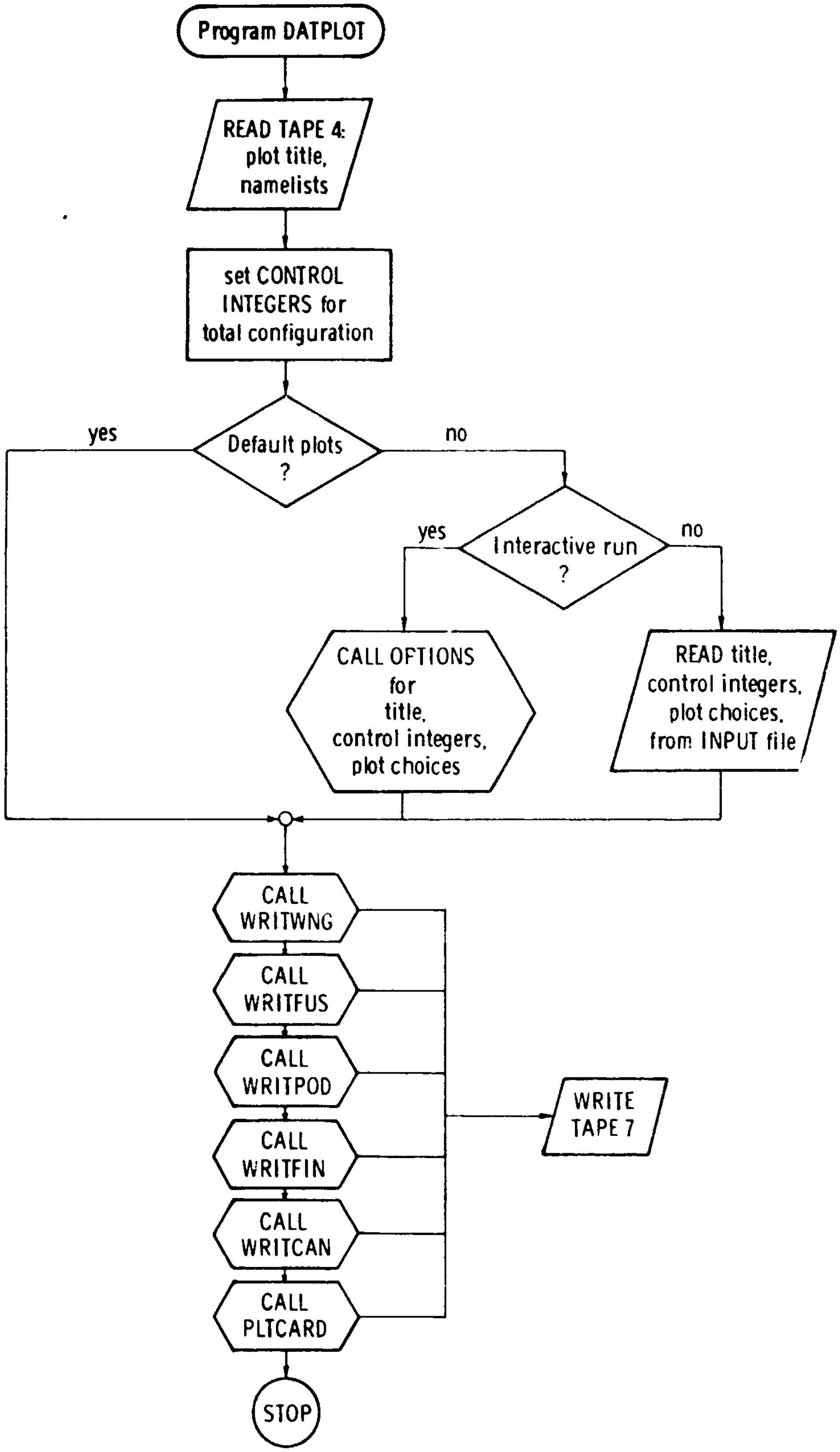

Figure 9 - **Flowchart for Program DATPLOT**